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Direct Current Circuit Breakers



Direct Current Circuit Breakers

Product Description

DC (direct current) systems and applications are becoming commonplace as alternative energy sources have expanded and the number of DC devices and data centers using DC power has swelled.

Eaton offers molded case circuit breakers and switches to meet circuit protection and switching requirements for a host of different DC end use requirements. Applications include UPS battery supply circuits, solar systems and electric vehicle charging, as well as commercial and industrial distribution.

Current ratings are available from 15 to 2500A, with a full scale of voltage and interrupting ratings to address needs ranging from standard to the highest performance. Optional internal accessories provide remote tripping and indication of breaker status.

The DC breaker family is UL® 489 listed and exceeds the requirements in UL 489 Supplement SC for UPS applications. Eaton breakers may be applied in both ungrounded and select grounded applications, with poles connected in series to operate at the maximum voltages shown on **Page V15-T3-3**. To use DC circuit breakers on 600V grounded systems, three poles in series must be connected on the ungrounded leg.

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The HFDDC through HMDLDC DC breakers use the same internal and external accessories as their Series C or Series G AC frame equivalents. NBDC and PBDC use the same internal and external accessories as standard NB and PB breakers.

Many of the Eaton AC molded case circuit breakers carry 250 Vdc ratings for ungrounded systems. Refer to **Volume 4—Circuit Protection**, CA08100005E, Tab 2 for these interrupting tables.

Quick Reference Direct Current Circuit Breakers**UL 489 Interrupting Capacity Ratings**

Circuit Breaker Type	Maximum Amperes	Interrupting Capacity (kA)								
		Volts DC ^①								
		125	Poles in Series	250 ^②	Poles in Series	500	600	Poles in Series	750 ^②	Poles in Series
EGEDC	100	10	1	35	2	35	—	3	—	—
EGSDC	100	35	1	42	2	50	—	3	—	—
EGHDC	100	42	1	50	2	65	—	3	—	—
HFDDC	225	42	1	50	2	—	42	3	42	4
JGEDC	250	35	1	35	2	—	35	3	—	—
JGSDC	250	42	1	42	2	—	50	3	—	—
JGHDC	250	50	1	50	2	—	65	3	—	—
HJDDC	250	42	1	50	2	—	42	3	—	—
HKDDC	400	42	1	50	2	—	42	3	—	—
LGEDC	600	22	1	22	2	—	35	3	—	—
LGSDC	600	22	1	22	2	—	50	3	—	—
LGHDC	600	50	1	50	2	—	65	3	—	—
HLDDC	600	42	1	50	2	—	35	3	—	—
HLDDC ^③	1200	42	1	50	2	—	—	—	—	—
HMDLDC	800	42	1	50	2	—	35	3	—	—
NBDC	1200	42	1	50	2	—	50	3	—	—
PBDC	2500	42	1	65	2	—	65	3	—	—

IEC 60947-2 Interrupting Capacity Ratings

Circuit Breaker Type	Maximum Amperes	125 Volts DC		Poles in Series	250 Volts DC		Poles in Series	600 Volts DC		Poles in Series
		Icu	Ics		Icu	Ics		Icu	Ics	
EGEDC	100	10	10	1	10	10	2	—	—	—
EGSDC	100	35	35	1	35	35	2	—	—	—
EGHDC	100	42	42	1	42	42	2	—	—	—
JGEDC	250	22	22	1	22	22	2	—	—	—
JGSDC	250	22	22	1	22	22	2	—	—	—
JGHDC	250	42	42	1	42	42	2	—	—	—
HJDDC	250	—	—	—	—	—	—	20	10	3
LGEDC	600	22	22	1	22	22	2	—	—	—
LGSDC	600	22	22	1	22	22	2	—	—	—
LGHDC	600	42	42	1	42	42	2	—	—	—
HLDDC	600	—	—	—	—	—	—	20	10	3
HMDLDC	800	—	—	—	—	—	—	20	10	3

Notes

^① DC ratings apply to substantially non-inductive circuits. Time constants per UL 489.

^② EGEDC through HMDLDC have been tested up to 300 Vdc to allow for battery charging voltages. 750 Vdc is common in transportation applications. HFDDC, four-pole 750 Vdc is available up to 150A maximum. 300 Vdc and 750 Vdc are not UL 489 listed voltage ratings.

^③ Four-pole frame with two-poles connected in parallel.

See **Page V15-T3-14** for series connection diagrams. Use NEC[®] rated cable to connect/short poles in series as shown.

3.1

Direct Current Circuit Breakers

Specialty Breakers

Catalog Number Selection

DC Circuit Breaker

3

HFDDC 3 150 W

Frame	Number of Poles	Trip Unit Ampere Rating	Suffix
EGEDC = Series G—E (100A max.) EGSDC = Series G—E (100A max.) EGHDC = Series G—E (100A max.) HFDDC = Series C—F (225A max.) JGEDC = Series G—J (250A max.) JGSDC = Series G—J (250A max.) JGHDC = Series G—J (250A max.) HJDDC = Series C—J (250A max.) HKDDC = Series C—K (400A max.) LGEDC = Series G—L (600A max.) LGSDC = Series G—L (600A max.) LGHDC = Series G—L (600A max.) HLDDC = Series C—L (1200A max.) HMDLDC = Series C—M (800A max.) NBDC = NB (1200A max.) PBDC = PB (2500A max.)	1 = Single-pole 2 = Two-pole 3 = Three-pole 4 = Four-pole	015 = 15A 020 = 20A 025 = 25A 030 = 30A 035 = 35A 040 = 40A 045 = 45A 050 = 50A 060 = 60A 070 = 70A 080 = 80A 090 = 90A 100 = 100A 110 = 110A 125 = 125A 150 = 150A 175 = 175A 200 = 200A 225 = 225A 250 = 250A 300 = 300A 350 = 350A 400 = 400A 450 = 450A 500 = 500A 600 = 600A 700 = 700A 800 = 800A 900 = 900A 1000 = 1000A 1200 = 1200A 1600 = 1600A 2000 = 2000A 2500 = 2500A	Series C, NB and PB Frames K = Molded case switch L = Line and load terminals, F-Frame MW = 135% magnetic trip unit, without terminals W = Without terminals Series G Frames FFG = Fixed thermal, fixed magnetic trip unit, with terminals FFW = Fixed thermal, fixed magnetic trip unit, without terminals FAG = Fixed thermal, adjustable magnetic trip unit, with terminals FAW = Fixed thermal, adjustable magnetic trip unit, without terminals KSG = Molded case switch, with terminals KSW = Molded case switch, without terminals

Product Selection

Type EGEDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 35 kAIC at 500 Vdc

Maximum Continuous Ampere Rating at 40°C	Complete Circuit Breaker with Terminals Catalog Number	Complete Circuit Breaker without Terminals Catalog Number
25	EGEDC3025FFG	EGEDC3025FFW
30	EGEDC3030FFG	EGEDC3030FFW
35	EGEDC3035FFG	EGEDC3035FFW
40	EGEDC3040FFG	EGEDC3040FFW
45	EGEDC3045FFG	EGEDC3045FFW
50	EGEDC3050FFG	EGEDC3050FFW
60	EGEDC3060FFG	EGEDC3060FFW
70	EGEDC3070FFG	EGEDC3070FFW
80	EGEDC3080FFG	EGEDC3080FFW
90	EGEDC3090FFG	EGEDC3090FFW
100	EGEDC3100FFG	EGEDC3100FFW

Type EGSDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 50 kAIC at 500 Vdc

Maximum Continuous Ampere Rating at 40°C	Complete Circuit Breaker with Terminals Catalog Number	Complete Circuit Breaker without Terminals Catalog Number
25	EGSDC3025FFG	EGSDC3025FFW
30	EGSDC3030FFG	EGSDC3030FFW
35	EGSDC3035FFG	EGSDC3035FFW
40	EGSDC3040FFG	EGSDC3040FFW
45	EGSDC3045FFG	EGSDC3045FFW
50	EGSDC3050FFG	EGSDC3050FFW
60	EGSDC3060FFG	EGSDC3060FFW
70	EGSDC3070FFG	EGSDC3070FFW
80	EGSDC3080FFG	EGSDC3080FFW
90	EGSDC3090FFG	EGSDC3090FFW
100	EGSDC3100FFG	EGSDC3100FFW

Type EGHDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 65 kAIC at 500 Vdc

Maximum Continuous Ampere Rating at 40°C	Complete Circuit Breaker with Terminals Catalog Number	Complete Circuit Breaker without Terminals Catalog Number
25	EGHDC3025FFG	EGHDC3025FFW
30	EGHDC3030FFG	EGHDC3030FFW
35	EGHDC3035FFG	EGHDC3035FFW
40	EGHDC3040FFG	EGHDC3040FFW
45	EGHDC3045FFG	EGHDC3045FFW
50	EGHDC3050FFG	EGHDC3050FFW
60	EGHDC3060FFG	EGHDC3060FFW
70	EGHDC3070FFG	EGHDC3070FFW
80	EGHDC3080FFG	EGHDC3080FFW
90	EGHDC3090FFG	EGHDC3090FFW
100	EGHDC3100FFG	EGHDC3100FFW

HFDDC


**Type HFDDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 42 kAIC at 600 Vdc**

Maximum Continuous Ampere Rating at 40°C	Complete Circuit Breaker with Line and Load Terminals ^①			
	Single-Pole Catalog Number	Two-Pole Catalog Number	Three-Pole Catalog Number	Four-Pole Catalog Number
15	HFDDC1015L	HFDDC2015L	HFDDC3015L	HFDDC4015L
20	HFDDC1020L	HFDDC2020L	HFDDC3020L	HFDDC4020L
25	HFDDC1025L	HFDDC2025L	HFDDC3025L	HFDDC4025L
30	HFDDC1030L	HFDDC2030L	HFDDC3030L	HFDDC4030L
35	HFDDC1035L	HFDDC2035L	HFDDC3035L	HFDDC4035L
40	HFDDC1040L	HFDDC2040L	HFDDC3040L	HFDDC4040L
45	HFDDC1045L	HFDDC2045L	HFDDC3045L	HFDDC4045L
50	HFDDC1050L	HFDDC2050L	HFDDC3050L	HFDDC4050L
60	HFDDC1060L	HFDDC2060L	HFDDC3060L	HFDDC4060L
70	HFDDC1070L	HFDDC2070L	HFDDC3070L	HFDDC4070L
80	HFDDC1080L	HFDDC2080L	HFDDC3080L	HFDDC4080L
90	HFDDC1090L	HFDDC2090L	HFDDC3090L	HFDDC4090L
100	HFDDC1100L	HFDDC2100L	HFDDC3100L	HFDDC4100L
110	HFDDC1110L	HFDDC2110L	HFDDC3110L	HFDDC4110L
125	HFDDC1125L	HFDDC2125L	HFDDC3125L	HFDDC4125L
150	HFDDC1150L	HFDDC2150L	HFDDC3150L	HFDDC4150L
175	—	HFDDC2175L	HFDDC3175L	—
200	—	HFDDC2200L	HFDDC3200L	—
225	—	HFDDC2225L	HFDDC3225L	—

**Type JGEDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 35 kAIC at 600 Vdc**

Maximum Continuous Ampere Rating at 40°C	Complete Breaker Catalog Number	Circuit Breaker Frame Only ^② Catalog Number	Thermal-Magnetic Trip Unit Catalog Number	Standard Terminals Catalog Number
70	JGEDC3070FAG	JGEDC3250NN	JT3070FA	T250FJ
90	JGEDC3090FAG	JGEDC3250NN	JT3090FA	T250FJ
100	JGEDC3100FAG	JGEDC3250NN	JT3100FA	T250FJ
125	JGEDC3125FAG	JGEDC3250NN	JT3125FA	T250FJ
150	JGEDC3150FAG	JGEDC3250NN	JT3150FA	T250FJ
175	JGEDC3175FAG	JGEDC3250NN	JT3175FA	T250FJ
200	JGEDC3200FAG	JGEDC3250NN	JT3200FA	T250FJ
225	JGEDC3225FAG	JGEDC3250NN	JT3225FA	T250FJ
250	JGEDC3250FAG	JGEDC3250NN	JT3250FA	T250FJ

Notes

① For breaker without terminals, replace "L" with "W" at end of catalog number.

② For complete breaker, order individual frame, trip unit and terminals for field installation.

**Type JGSDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 50 kAIC at 600 Vdc**

Maximum Continuous Ampere Rating at 40°C	Complete Breaker Catalog Number	Circuit Breaker Frame Only ^① Catalog Number	Thermal-Magnetic Trip Unit Catalog Number	Standard Terminals Catalog Number
70	JGSDC3070FAG	JGSDC3250NN	JT3070FA	T250FJ
90	JGSDC3090FAG	JGSDC3250NN	JT3090FA	T250FJ
100	JGSDC3100FAG	JGSDC3250NN	JT3100FA	T250FJ
125	JGSDC3125FAG	JGSDC3250NN	JT3125FA	T250FJ
150	JGSDC3150FAG	JGSDC3250NN	JT3150FA	T250FJ
175	JGSDC3175FAG	JGSDC3250NN	JT3175FA	T250FJ
200	JGSDC3200FAG	JGSDC3250NN	JT3200FA	T250FJ
225	JGSDC3225FAG	JGSDC3250NN	JT3225FA	T250FJ
250	JGSDC3250FAG	JGSDC3250NN	JT3250FA	T250FJ

JGHDC3250NN



**Type JGHDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 65 kAIC at 600 Vdc**

Maximum Continuous Ampere Rating at 40°C	Complete Breaker Catalog Number	Circuit Breaker Frame Only ^① Catalog Number	Thermal-Magnetic Trip Unit Catalog Number	Standard Terminals Catalog Number
70	JGHDC3070FAG	JGHDC3250NN	JT3070FA	T250FJ
90	JGHDC3090FAG	JGHDC3250NN	JT3090FA	T250FJ
100	JGHDC3100FAG	JGHDC3250NN	JT3100FA	T250FJ
125	JGHDC3125FAG	JGHDC3250NN	JT3125FA	T250FJ
150	JGHDC3150FAG	JGHDC3250NN	JT3150FA	T250FJ
175	JGHDC3175FAG	JGHDC3250NN	JT3175FA	T250FJ
200	JGHDC3200FAG	JGHDC3250NN	JT3200FA	T250FJ
225	JGHDC3225FAG	JGHDC3250NN	JT3225FA	T250FJ
250	JGHDC3250FAG	JGHDC3250NN	JT3250FA	T250FJ

HJDDC3250



**Type HJDDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 42 kAIC at 600 Vdc**

Maximum Continuous Ampere Rating at 40°C	Circuit Breaker Frame Only ^① Catalog Number	Thermal-Magnetic Trip Unit Catalog Number	Standard Terminals Catalog Number
70	HJDDC3250F	JT3070T	TA250KB
90	HJDDC3250F	JT3090T	TA250KB
100	HJDDC3250F	JT3100T	TA250KB
125	HJDDC3250F	JT3125T	TA250KB
150	HJDDC3250F	JT3150T	TA250KB
175	HJDDC3250F	JT3175T	TA250KB
200	HJDDC3250F	JT3200T	TA250KB
225	HJDDC3250F	JT3225T	TA250KB
250	HJDDC3250F	JT3250T	TA250KB

Note

^① For complete breaker, order individual frame, trip unit and terminals for field installation.

HKDDC3400


**Type HKDDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 42 kAIC at 600 Vdc**

Maximum Continuous Ampere Rating at 40°C	Circuit Breaker Frame Only ^① Catalog Number	Thermal-Magnetic Trip Unit Catalog Number	Standard Terminals Catalog Number
100	HKDDC3400F	KT3100T	TA300K
125	HKDDC3400F	KT3125T	TA300K
150	HKDDC3400F	KT3150T	TA300K
175	HKDDC3400F	KT3175T	TA300K
200	HKDDC3400F	KT3200T	TA300K
225	HKDDC3400F	KT3225T	TA300K
250	HKDDC3400F	KT3250T	TA350K
300	HKDDC3400F	KT3300T	TA350K
350	HKDDC3400F	KT3350T	TA350K
400	HKDDC3400F	KT3400T	3TA400K ^②

LGEDC3630NN


**Type LGEDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 35 kAIC at 600 Vdc**

Maximum Continuous Ampere Rating at 40°C	Complete Breaker Catalog Number	Circuit Breaker Frame Only ^① Catalog Number	Thermal-Magnetic Trip Unit Catalog Number	Standard Terminals Catalog Number
250	LGEDC3250FAG	LGEDC3630NN	LT3250FA	TA350LK
300	LGEDC3300FAG	LGEDC3630NN	LT3300FA	TA350LK
350	LGEDC3350FAG	LGEDC3630NN	LT3350FA	TA350LK
400	LGEDC3400FAG	LGEDC3630NN	LT3400FA	TA350LK
500	LGEDC3500FAG	LGEDC3630NN	LT4500FA	3TA632LK ^②
600	LGEDC3600FAG	LGEDC3630NN	LT3600FA	3TA632LK ^②

**Type LGSDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 50 kAIC at 600 Vdc**

Maximum Continuous Ampere Rating at 40°C	Complete Breaker Catalog Number	Circuit Breaker Frame Only ^① Catalog Number	Thermal-Magnetic Trip Unit Catalog Number	Standard Terminals Catalog Number
250	LGSDC3250FAG	LGSDC3630NN	LT3250FA	TA350LK
300	LGSDC3300FAG	LGSDC3630NN	LT3300FA	TA350LK
350	LGSDC3350FAG	LGSDC3630NN	LT3350FA	TA350LK
400	LGSDC3400FAG	LGSDC3630NN	LT3400FA	TA350LK
500	LGSDC3500FAG	LGSDC3630NN	LT4500FA	3TA632LK ^②
600	LGSDC3600FAG	LGSDC3630NN	LT3600FA	3TA632LK ^②

Notes

^① For complete breaker, order individual frame, trip unit and terminals for field installation.

^② Three-pole kit.

**Type LGHDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 65 kAIC at 600 Vdc**

Maximum Continuous Ampere Rating at 40°C	Complete Breaker Catalog Number	Circuit Breaker Frame Only ^① Catalog Number	Thermal-Magnetic Trip Unit Catalog Number	Standard Terminals Catalog Number
250	LGHDC3250FAG	LGHDC3630NN	LT3250FA	TA350LK
300	LGHDC3300FAG	LGHDC3630NN	LT3300FA	TA350LK
350	LGHDC3350FAG	LGHDC3630NN	LT3350FA	TA350LK
400	LGHDC3400FAG	LGHDC3630NN	LT3400FA	TA350LK
500	LGHDC3500FAG	LGHDC3630NN	LT4500FA	3TA632LK ^②
600	LGHDC3600FAG	LGHDC3630NN	LT3600FA	3TA632LK ^②

HLDDC



**Type HLDDC DC Circuit Breakers—
Three-Pole High Interrupting Capacity 35 kAIC at 600 Vdc**

Maximum Continuous Ampere Rating at 40°C	Circuit Breaker Frame Only ^① Catalog Number	Thermal-Magnetic Trip Unit Catalog Number	Standard Terminals Catalog Number
300	HLDDC3600F	LT3300T	TA602LD
350	HLDDC3600F	LT3350T	TA602LD
400	HLDDC3600F	LT3400T	TA602LD
450	HLDDC3600F	LT3450T	TA602LD
500	HLDDC3600F	LT3500T	TA602LD
600	HLDDC3600F	LT3600T	3TA603LDK ^②

**Type HLDDC DC Circuit Breakers—
Two-Pole High Interrupting Capacity 50 kAIC at 250 Vdc ^{③④}**

Maximum Continuous Ampere Rating at 40°C	Complete Breaker Catalog Number
600	HLDDC20600
700	HLDDC20700
800	HLDDC20800
900	HLDDC20900
1000	HLDDC21000
1200	HLDDC21200

Notes

- ^① For complete breaker, order individual frame, trip unit and terminals for field installation.
- ^② Three-pole kit.
- ^③ Includes breaker frame, trip unit and terminals.
- ^④ Four-pole breaker with two poles wired in parallel.

3.1

Direct Current Circuit Breakers

Specialty Breakers

3

HMDLDC3800F



Type HMDLDC DC Circuit Breakers— Three-Pole High Interrupting Capacity 35 kAIC at 600 Vdc

Maximum Continuous Ampere Rating at 40°C	Circuit Breaker Frame Only ^① Catalog Number	Thermal-Magnetic Trip Unit Catalog Number	Standard Terminals Catalog Number
300	HMDLDC3800F	MT3300T	TA700MA1
350	HMDLDC3800F	MT3350T	TA700MA1
400	HMDLDC3800F	MT3400T	TA700MA1
450	HMDLDC3800F	MT3450T	TA700MA1
500	HMDLDC3800F	MT3500T	TA700MA1
600	HMDLDC3800F	MT3600T	TA700MA1
700	HMDLDC3800F	MT3700T	TA700MA1
800	HMDLDC3800F	MT3800T	TA800MA2

Type NBDC DC Circuit Breakers— Three-Pole High Interrupting Capacity 50 kAIC at 600 Vdc

Maximum Continuous Ampere Rating at 40°C	Complete Circuit Breaker Factory Assembled without Terminals ^② Catalog Number	Includes Magnetic Trip Unit Calibrated at 135%	Standard Terminals Catalog Number
700	NBDC3700MW	Included	TA1000NB1
800	NBDC3800MW	Included	TA1000NB1
900	NBDC3900MW	Included	TA1000NB1
1000	NBDC31000MW	Included	TA1000NB1
1200	NBDC31200MW	Included	TA1200NB1

Type PBDC DC Circuit Breakers— Three-Pole High Interrupting Capacity 65 kAIC at 600 Vdc

Maximum Continuous Ampere Rating at 40°C	Complete Circuit Breaker Factory Assembled without Terminals ^② Catalog Number	Includes Magnetic Trip Unit Calibrated at 135%	Standard Rear Connectors Catalog Number
1600	PBDC31600W	Included	BA2000PB
2000	PBDC32000W	Included	BA2000PB
2500	PBDC32500W	Included	BA2500PB

Notes

- ^① Includes frame and trip unit. Order terminals or connectors separately.
- ^② For complete breaker, order individual frame, trip unit and terminals for field installation.

DC Breaker Terminal Wire Ranges

Breaker Frame	Maximum Breaker Ampacity	Terminal Body Material	Wire Type	AWG Wire Range/ Number of Conductors	Metric Wire Range mm ²	Number of Terminals Included	Standard Terminal Catalog Number
EGEDC, EGSDC, EGHDC	100	Aluminum	Cu/Al	14–1/0	2.5–50	3	3TA125EF
HFDDC	20	Steel	Cu/Al	14–10 (1)	2.5–4 (1)	3	3T20FB
	100	Steel	Cu/Al	14–1/0 (1)	2.5–50 (1)	3	3T100FB
	225	Aluminum	Cu/Al	4–4/0 (1)	25–95 (1)	3	3TA225FD
JGEDC, JGSDC, JGHDC	250	Stainless steel	Cu	4–350 (1)	25–185 (1)	1	T250FJ
HJDDC	250	Aluminum	Cu/Al	4–350 kcmil (1)	25–185 (1)	1	TA250KB
HKDDC	225	Aluminum	Cu/Al	3–350 kcmil (1)	35–185 (1)	1	TA300K
	350	Aluminum	Cu/Al	250–500 kcmil (1)	120–240 (1)	1	TA350K
	400	Aluminum	Cu/Al	3/0–250 kcmil (2)	95–120 (1)	3	3TA400K
LGEDC, LGSDC, LGHDC	400	Aluminum	Cu/Al	2–500 (1)	35–240 (1)	1	TA350LK
	630	Aluminum	Cu/Al	2–500 kcmil (2)	35–240 (2)	1	TA632L
	630	Aluminum	Cu/Al	2–500 kcmil (2)	35–240 (2)	3	3TA632LK
HLDDC	500	Aluminum	Cu/Al	3/0–350 kcmil (2)	95–150 (2)	1	TA602LD
	600	Aluminum	Cu/Al	400–500 kcmil (2)	185–240 (2)	3	3TA603LDK
HMDLDC	600	Aluminum	Cu/Al	1–500 kcmil (2)	—	1	TA700MA1
	800	Aluminum	Cu/Al	3/0–400 kcmil (3)	—	1	TA800MA2
NBDC	700	Aluminum	Cu/Al	3/0–400 kcmil (3)	95–185 (3)	1	TA1000NB1
	800	Aluminum	Cu/Al	3/0–400 kcmil (3)	95–185 (3)	1	TA1000NB1
	900	Aluminum	Cu/Al	3/0–400 kcmil (3)	95–185 (3)	1	TA1000NB1
	1000	Aluminum	Cu/Al	3/0–400 kcmil (3)	95–185 (3)	1	TA1000NB1
	1200	Aluminum	Cu/Al	4/0–500 kcmil (4)	120–240 (4)	1	TA1200NB1

Molded Case Switches

Eaton's DC molded case switches are used in applications requiring a compact, high-capacity disconnect. They are UL 489 listed and have automatic high instantaneous current protection. These devices do not provide overload protection.

Molded Case Switches

Maximum Continuous Ampere Rating at 40°C	Interrupting Capacity (Volts DC)	Poles in Series	With Line and Load Terminals	Without Line and Load Terminals
			Catalog Number	Catalog Number
600 Vdc Maximum				
100	42	3	HFDDC3100KL	HFDDC3100KW
150	42	3	HFDDC3150KL	HFDDC3150KW
225	42	3	HFDDC3225KL	HFDDC3225KW
250	65	3	JGKDC3250KSG	JGKDC3250KSW
250	42	3	HJDDC3250K	HJDDC3250KW
400	35	3	HKDDC3400K	HKDDC3400KW
	65	3	LGKDC3400KSG	LGKDC3400KSW
600	65	3	LGKDC3630KSG	LGKDC3630KSW
	35	3	HLDDC3600K	HLDDC3600WK
800	35	3	HMDLDC3800K	HMDLDC3800WK
500 Vdc Maximum				
100	65	3	EGK3100KSG	EGK3100KSW
250 Vdc Maximum				
100	50	2	HFDDC2100KL	HFDDC2100KW
150	50	2	HFDDC2150KL	HFDDC2150KW
225	50	2	HFDDC2225KL	HFDDC2225KW
1200	50	①	HLDDC21200K ①	HLDDC21200WK ①

Note

① Four-pole frame with two-pole connected in parallel.

3.1

Direct Current Circuit Breakers

Specialty Breakers

Accessories

Internal Accessories

Field Installation Kits

Description	Factory Installation (HFDDC)	HFDDC ①	EGEDC, EGSDC, EGHDC	JGEDC, JGSDC, JGHDC	HJDDC	HKDDC	HLDDC	HMDLDC	NBDC	PBDC	
				LGEDC, LGSDC, LGHDC							
Right-Pole Mounting											
Auxiliary switch											
1A-1B	A06	A1X1PK	AUX1A1BPK	AUX1A1BPK	A1X2PK	A1X13PK	A1X4PK	A1X4PK	4980D16G05	2602D32G14	
2A-2B	A13	A2X1RPK	AUX2A2BPK	AUX2A2BPK	A2X2PK	A2X3PK	A2X4PK	A2X4PK	4980D16G06	2602D32G15	
Alarm switch											
1 make/1 break	B06	A1L1RPK	ALM1M1BEPK	ALM1M1BJPK	A1L2RPK	A1L3RPK	A1L4RPK	A1L4RPK	—	—	
Auxiliary and alarm combo											
1A-1B, 1 make/1 break	C05	AAL1RPK	AUXALRMEPK	AUXALRMJPK	AAL2RPK	AAL3RPK	AA114RPK	AA114RPK	—	—	
Left-Pole Mounting											
Shunt trip											
12 Vdc	S02	SNT1LP03K	SNT012CPK	SNT012CPK	SNT2P04K	SNT3P04K	SNT4LP03K	SNT4LP03K	2606D58G14	2606D59G28	
24 Vdc	S02	SNT1LP03K	SNT060CPK	SNT060CPK	SNT2P04K	SNT3P04K	SNT4LP03K	SNT4LP03K	2606D58G13	2606D59G27	
48 Vdc	S06	SNT1LP08K	SNT060CPK	SNT060CPK	SNT2P06K	SNT3P06K	SNT4LP23K	SNT4LP23K	2606D58G12	2606D59G26	
60 Vdc	S06	SNT1LP08K	SNT060CPK	SNT060CPK	SNT2P06K	SNT3P06K	SNT4LP23K	SNT4LP23K	2606D58G11	2606D59G25	
125 Vdc	S10	SNT1LP12K	SNT120CPK	SNT120CPK	SNT2P11K	SNT3P11K	SNT4LP26K	SNT4LP26K	2606D58G10	2606D59G24	
250 Vdc	S14	SNT1LP18K	—	—	SNT2P14K	SNT3P14K	SNT4LP14K	SNT4LP14K	2606D58G09	2606D59G23	
120 Vac	S06	SNT1LP12K	SNT120CPK	SNT120CPK	SNT2P11K	SNT3P11K	SNT4LP11K	SNT4LP11K	2060D58G05	2060D59G19	
Undervoltage release											
12 Vdc	U30	UVH1LP20K	UVR012DPK	UVR012DPK	UVH2LP20K	UVH3LP20K	UVH4LP20K	UVH4LP20K	372D032G06	4976D85G11	
24 Vdc	U34	UVH1LP21K	UVR024DPK	UVR024DPK	UVH2LP21K	UVH3LP21K	UVH4LP21K	UVH4LP21K	372D032G07	4976D85G12	
48 Vdc	U38	UVH1LP22K	UVR048DPK	UVR048DPK	UVH2LP22K	UVH3LP22K	UVH4LP22K	UVH4LP22K	372D032G08	4976D85G13	
125 Vdc	U42	UVH1LP26K	UVR125DPK	UVR125DPK	UVH2LP26K	UVH3LP26K	UVH4LP26K	UVH4LP26K	372D032G09	4976D85G17	
250 Vdc	U46	UVH1LP28K	UVR250DPK	UVR250DPK	UVH2LP28K	UVH3LP28K	UVH4LP28K	UVH4LP28K	372D032G10	4976D85G18	
120 Vac	U14	UVH1LP08K	UVR120APK	UVR120APK	UVH2LP08K	UVH3LP08K	UVH4LP08K	UVH4LP08K	373D632G05	5674D29G01	

Note

① F-Frame circuit breakers are factory sealed. Underwriters Laboratories requires that internal accessories be installed at the factory. Internal accessories are UL listed for factory installation under E7819. Where local codes and standards permit and UL listing is not required, internal accessories can be field installed. Accessory installation should be done before the circuit breaker is mounted and connected.

One accessory can be mounted per pole, per breaker. Factory installation of accessories is available. Contact Eaton for assistance with part number configuration.

Jumpers

Jumpers must be ordered separately. Priced individually.

HFDDC Frame

Description	Maximum Amperes	Catalog Number
Single copper jumper	60	DC1F060 ^①
	100	DC1F100 ^①
	125	DC1F125 ^①
	225	DC1F225 ^①
Package of 2 aluminum jumpers	100	DC2FD100A
Package of 3 aluminum jumpers	100	DC3FD100A

JGEDC, JGSDC, JGHDC Frames

Description	Maximum Amperes	Catalog Number
Single aluminum jumper	250	DC1JG250A ^①
Package of 2 aluminum jumpers	250	DC2JG250A ^①
Package of 20 aluminum jumpers	250	DC20JG250A ^①

HKDDC Frame

Description	Maximum Amperes	Catalog Number
Single copper jumper	400	DC1K400 ^①
Package of 2 aluminum jumpers	400	DC2KD400A ^①
Package of 3 aluminum jumpers	400	DC3KD400A ^①

LGEDC, LGSDC, LGHDC Frames

Description	Maximum Amperes	Catalog Number
Package of 2 aluminum jumpers	400	DC2LG400A
Package of 3 aluminum jumpers	400	DC3LG400A
Package of 30 aluminum jumpers	400	DC30LG400A

Note

^① Not UL Listed; Non UL listed jumpers used in a UL application may need to be qualified by the OEM in their assembly. This may take place with UL or another certified testing agency.

3.1

Direct Current Circuit Breakers

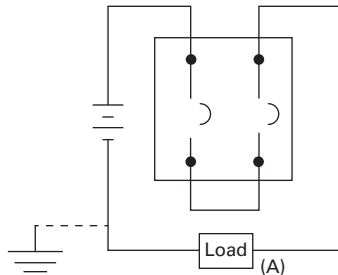
Specialty Breakers

Wiring Diagrams

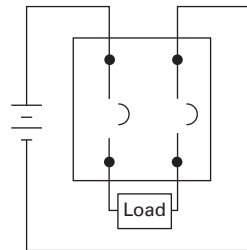
Series Connection Diagrams for DC Application ^{①②}

3

250 Vdc Maximum—Two Poles in Series

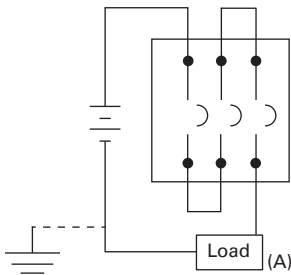


Suitable for use on ungrounded systems, or grounded systems that have one end of load (A) connected to grounded terminal, opposite poles in series connection.

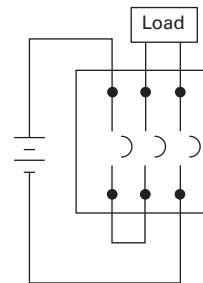


Suitable for use on ungrounded systems only.

500 Vdc or 600 Vdc Maximum—Three Poles in Series

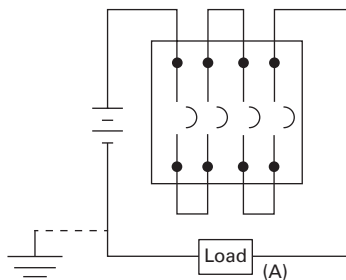


Suitable for use on ungrounded systems, or grounded systems that have one end of load (A) connected to grounded terminal, opposite poles in series connection.

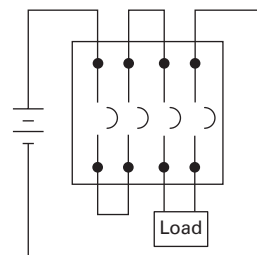


Suitable for use on ungrounded systems only.

750 Vdc Maximum—Four Poles in Series



Suitable for use on ungrounded systems, or grounded systems that have one end of load (A) connected to grounded terminal, opposite poles in series connection.



Suitable for use on ungrounded systems only.

Notes

- ① Poles in series connection is customer supplied. Use rated cable per NEC.
- ② For grounded systems, all poles in series must be connected on non-grounded terminal, with load connected to grounded terminal.

Dimensions

Approximate Dimensions in Inches (mm)

DC Breaker Dimensions

Frame	Number of Poles	Width	Height	Depth
EGEDC, EGSDC, EGHDC	3	3.00 (76.2)	5.50 (139.7)	2.99 (75.9)
HFDDC	1	1.38 (35.1)	6.00 (152.4)	3.38 (86.0)
	2	2.75 (70.0)	6.00 (152.4)	3.38 (86.0)
	3	4.13 (105.0)	6.00 (152.4)	3.38 (86.0)
	4	5.50 (139.7)	6.00 (152.4)	3.38 (86.0)
JGEDC, JGSDC, JGHDC	3	4.13 (104.9)	7.00 (177.8)	3.57 (90.7)
HJDDC	2, 3	4.13 (105.0)	10.00 (254.0)	4.06 (103.1)
HKDDC	2, 3	5.50 (139.7)	10.13 (257.3)	4.10 (104.1)
LGEDC, LGSDC, LGHDC	3	5.48 (139.2)	10.13 (257.3)	4.09 (103.9)
600A Max. HLDDC	2, 3	8.25 (209.6)	10.75 (273.1)	4.06 (103.1)
1200A Max. HLDDC	4	11.00 (279.4)	10.75 (273.1)	4.06 (103.1)
HMDLDC	2, 3	8.25 (209.6)	16.00 (406.4)	4.06 (103.1)
NBDC	3	8.25 (209.6)	16.00 (406.4)	5.50 (139.7)
PBDC	3	12.06 (306.3)	22.06 (560.3)	9.06 (230.1)

PVGuard Solar Photovoltaic Circuit Breakers



600 Vdc Per-Pole

1000 Vdc Poles-in-Series

Contents

Description

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PVGuard Solar Circuit Breakers—600 Vdc Per-Pole and 1000 Vdc Poles-in-Series

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Standards and Certifications	V15-T3-17
Product Selection	V15-T3-18
Accessories	V15-T3-20
Technical Data and Specifications	V15-T3-24
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PVGuard Solar Circuit Breakers—600 Vdc Per-Pole and 1000 Vdc Poles-in-Series

Product Overview

- Two PVGuard lineups
 - 600 Vdc per-pole breaker and switch. Each pole rated 600 Vdc
 - 1000 Vdc poles-in-series breaker and switch. Requires poles in series connection
- Both options UL 489B listed for solar photovoltaic circuit protection
- 50°C calibration
- Offers both 100% and 80% rated breakers
- Handle bi-directional current flow

Product Description

Photovoltaic (PV) systems convert the energy of the sun into electrical power that is fed directly into the electric grid. Within the balance of system (BOS), direct current (DC) circuit breakers protect the wiring connected from the PV modules to the combiner or the inverter, while also behaving as a disconnect.

Eaton is a global leader in circuit protection and brings this expertise to bear in the photovoltaic market. PVGuard solar circuit breakers are part of a product family that combines a disconnect with circuit protection in a single, compact, resettable device to protect and isolate DC circuits as needed in photovoltaic systems. PVGuard breakers can replace fuses, fuse holders and disconnects in combiner box and inverter applications—saving space, streamlining design, purchasing and receiving, and reducing spare parts requirements.

There are two PVGuard lineups to choose from: the industry-exclusive, 600 Vdc per-pole breakers and switches designed for residential and light commercial applications and 1000 Vdc poles-in-series breakers and switches for commercial and utility scale applications.

PVGuard 600 Vdc Per-Pole Lineup

Only Eaton can offer this breakthrough breaker that will save significant space, time and cost. As a single-circuit-per-pole device, it allows space savings of up to 66% when compared to traditional poles-in-series disconnects, switches and breakers. In addition, it eliminates the need for jumpers for poles-in-series connection—saving on installation time, labor and even inventory.

PVGuard 1000 Vdc Poles-in-Series Lineup

This 1000 Vdc poles-in-series lineup provides reliable and safe disconnect means and overcurrent protection in a single, compact device for commercial and utility scale PV systems. This solution does not require jumpers with the breaker/switch to be a UL 489B listed device, providing reliability and flexibility in design without limitation on implementation of the breaker/switch. If needed, cost-effective Eaton jumpers can be included.

Application Description

Photovoltaic (PV) systems convert the energy of the sun into electrical power that is fed directly into the electric grid. PVGard circuit breakers are used to protect the wiring from the modules to the combiner box or inverter from overcurrents, and to provide an isolation mechanism.

Eaton offers a complete line of UL 489 Listed multi-purpose 600 Vdc poles-in-series breakers and switches, as well as protection for the AC side of the inverter.

Features

PVGard breakers are uniquely designed with these features:

- Meets the higher voltage and lower fault current levels of solar systems
- Tested to extreme ambient conditions from -40°C to $+90^{\circ}\text{C}$
- Full complement of accessories for status, signalling, and on/off operation remotely
- Can handle bi-directional flow of current
- Can be applied in grounded, ungrounded or bi-polar systems
- Meets and exceeds the standards of UL 489B for photovoltaic molded case circuit breakers and molded case switches
- Available both standard (80%-rated) and 100%-rated breakers
- 50°C calibration
- Ability to open on signal from DC arc or ground fault detector
- Wide range of current ratings increases options for matching incoming strings
- Eliminates fuse stocking costs and matching issues

Designed specifically for high- and low-temperature demands of PV installations, PVGard circuit breakers undergo extreme ambient cycling tests, and carry a robust operating temperature range. Trip units calibrate at 100% and 80% of nameplate current in a 50°C ambient, ensuring continuous operation in higher temperature environments typical to solar.

Rigorous third-party testing includes limited and standard fault current tests, electrical and mechanical endurance, di-electric voltage withstand and temperature tests. Eaton's PVGard products are stand-alone devices without requiring jumpers to be UL 489B listed devices.

PVGard breakers are available with a full complement of accessories to provide string status, enable remote trip, on/off operation, and can be customized to site requirements.

Standards and Certifications

- Designed to meet UL 489B for solar photovoltaic circuit protection
- UL File E350638, Category Control Number DIUR



3.2

PVGard Solar Circuit Breakers

Specialty Breakers

Product Selection

Catalog number includes breaker frame and trip unit. Order terminals separately. See **Page V15-T3-22**. For complete internal and external accessories, see accessory section of each frame.

3

JG PVS Frame



JG PVS Frame, 250A Maximum, 600 Vdc Per Pole, 1.2 kA ①

Current Rating Amperes	Number Poles/ 600 Vdc Circuits	Trip Unit	80% Rated Catalog Number	100% Rated Catalog Number
90	3	Fixed thermal, fixed magnetic	JGPVS3090W	CJGPVS3090W
100	3	Fixed thermal, fixed magnetic	JGPVS3100W	CJGPVS3100W
125	3	Fixed thermal, fixed magnetic	JGPVS3125W	CJGPVS3125W
150	3	Fixed thermal, fixed magnetic	JGPVS3150W	CJGPVS3150W
175	3	Fixed thermal, fixed magnetic	JGPVS3175W	CJGPVS3175W
200	3	Fixed thermal, fixed magnetic	JGPVS3200W	CJGPVS3200W
225	3	Fixed thermal, fixed magnetic	JGPVS3225W	CJGPVS3225W
250	3	Fixed thermal, fixed magnetic	JGPVS3250W	CJGPVS3250W

KD PVS Frame



KD PVS Frame, 400A Maximum, 600 Vdc Per Pole, 3 kA ①

Current Rating Amperes	Number Poles/ 600 Vdc Circuits	Trip Unit	80% Rated Catalog Number	100% Rated Catalog Number
100	3	Fixed thermal, fixed magnetic	KDPVS3100W	CKDPVS3100W
125	3	Fixed thermal, fixed magnetic	KDPVS3125W	CKDPVS3125W
150	3	Fixed thermal, fixed magnetic	KDPVS3150W	CKDPVS3150W
175	3	Fixed thermal, fixed magnetic	KDPVS3175W	CKDPVS3175W
200	3	Fixed thermal, fixed magnetic	KDPVS3200W	CKDPVS3200W
225	3	Fixed thermal, fixed magnetic	KDPVS3225W	CKDPVS3225W
250	3	Fixed thermal, fixed magnetic	KDPVS3250W	CKDPVS3250W
300	3	Fixed thermal, fixed magnetic	KDPVS3300W	CKDPVS3300W
350	3	Fixed thermal, fixed magnetic	KDPVS3350W	CKDPVS3350W
400	3	Fixed thermal, fixed magnetic	KDPVS3400W	CKDPVS3400W

Note

① Terminals not included with frames.

Catalog number includes breaker frame and trip unit. Order terminals separately. See **Page V15-T3-22**.

FD PV Frame



FD PV Frame, 100A Maximum, 1000 Vdc, 3 kA ①

Current Rating Amperes	Poles in Series	Trip Unit	80% Rated Catalog Number	100% Rated Catalog Number
30	4	Fixed thermal, fixed magnetic	FDPV4030W	CFDPV4030W
40	4	Fixed thermal, fixed magnetic	FDPV4040W	CFDPV4040W
50	4	Fixed thermal, fixed magnetic	FDPV4050W	CFDPV4050W
60	4	Fixed thermal, fixed magnetic	FDPV4060W	CFDPV4060W
70	4	Fixed thermal, fixed magnetic	FDPV4070W	CFDPV4070W
80	4	Fixed thermal, fixed magnetic	FDPV4080W	CFDPV4080W
90	4	Fixed thermal, fixed magnetic	FDPV4090W	CFDPV4090W
100	4	Fixed thermal, fixed magnetic	FDPV4100W	CFDPV4100W

KD PV Frame



KD PV Frame, 250A Maximum, 1000 Vdc, 5 kA ①

Current Rating Amperes	Poles in Series	Trip Unit	80% Rated Catalog Number	100% Rated Catalog Number
125	4	Fixed thermal, fixed magnetic	KDPV4125W	CKDPV4125W
150	4	Fixed thermal, fixed magnetic	KDPV4150W	CKDPV4150W
175	4	Fixed thermal, fixed magnetic	KDPV4175W	CKDPV4175W
200	4	Fixed thermal, fixed magnetic	KDPV4200W	CKDPV4200W
225	4	Fixed thermal, fixed magnetic	KDPV4225W	CKDPV4225W
250	4	Fixed thermal, fixed magnetic	KDPV4250W	CKDPV4250W
300	4	Fixed thermal, fixed magnetic	KDPV4300W	CKDPV4300W
350	4	Fixed thermal, fixed magnetic	KDPV4350W	CKDPV4350W

LG PV Frame



LG PV Frame, 400A Maximum, 1000 Vdc, 5 kA ①

Current Rating Amperes	Poles in Series	Trip Unit	80% Rated Catalog Number	100% Rated Catalog Number
250	4	Fixed thermal, fixed magnetic	LGPV4250FFW	CLGPV4250FFW
300	4	Fixed thermal, fixed magnetic	LGPV4300FFW	CLGPV4300FFW
350	4	Fixed thermal, fixed magnetic	LGPV4350FFW	CLGPV4350FFW
400	4	Fixed thermal, fixed magnetic	LGPV4400FFW	CLGPV4400FFW

MDL PV Frame



MDL PV Frame, 600A Maximum, 1000 Vdc, 7.5 kA ①

Current Rating Amperes	Poles in Series	Trip Unit	80% Rated Catalog Number	100% Rated Catalog Number
300	3	Fixed thermal, fixed magnetic	MDLPV3300W	CMDLPV3300W
350	3	Fixed thermal, fixed magnetic	MDLPV3350W	CMDLPV3350W
400	3	Fixed thermal, fixed magnetic	MDLPV3400W	CMDLPV3400W
450	3	Fixed thermal, fixed magnetic	MDLPV3450W	CMDLPV3450W
500	3	Fixed thermal, fixed magnetic	MDLPV3500W	CMDLPV3500W
600	3	Fixed thermal, fixed magnetic	MDLPV3600W	CMDLPV3600W

Note

① Terminals not included with frames.

Accessories

Available Accessories

- Auxiliary switch
- Shunt trip
- Electrical operator
- Alarm lockout
- Undervoltage release
- Terminals
- Lock-off devices
- End cap kits
- Rotary handle mechanisms
- Flexible shaft handle mechanisms

Optional modifications

- Freeze testing

For complete internal and external accessories, see the accessory section of each frame.

External Accessories

Description	Frame	Catalog Number
Imperial Base Mounting Hardware		
0.164-32 x 1.5-inch pan-head steel screws and lockwashers	FD PV	BMH1
0.250-20 x 1.5 inch pan-head steel screws and lockwashers	KD PV KD PVS	BMH3
—	JG PVS	N/A
—	LG PV	N/A
0.3125-18 x 1.25 inch filister-head steel screws and lockwashers and flat washers	MDL PV	BMH5
Metric Base Mounting Hardware		
M4–0.7 x 38 mm pan-head steel screws and lockwashers	FD PV	BMH1M
M6–0.7 x 38 mm pan-head steel screws and lockwashers	KD PV KD PVS	BMH3M
—	JG PVS	Included ^①
—	LG PV	Included ^①
M8-1.25 x 35 mm pan-head steel screws and lockwashers	MDL PV	BMH5M
Interphase Barriers		
	FD PV	IPB1
	KD PV KD PVS	IPB3
	JG PVS	FJIPBK ^②
	LG PV	IPB3
	MDL PV	IPB4
Non-Padlockable Handle Block		
	FD PV	LKD1
	KD PV KD PVS	LKD3
	JG PVS	N/A
	LG PV	N/A
	MDL PV	LKD4
Padlockable Handle Lock Hasp ^③		
	FD PV	PLK1
	KD PV KD PVS	PLK3
	JG PVS	FJPHL
	LG PV	LPHL
	MDL PV	HLK4

Factory Modifications—Freeze Testing to –40°C ^④

Frame	Modification Code
FD PV	F01
JG PVS	F01
KD PV and KD PVS	F01
LG PV	F01
MDL PV	F01
Special calibration—contact Eaton for availability	

Molded Case Switches

Eaton's DC molded case switches (MCS) are used in applications requiring a compact, high capacity disconnect. PVGard 1000 Vdc

MCS are UL 489B listed and have automatic instantaneous current protection. These devices do not provide overload protection.

Molded Case Switches

Maximum Continuous Ampere Rating at 50°C	Interrupting Capacity Vdc	Poles in Series	Catalog Number
1000 Vdc Maximum			
100	3000	4	FDPV4100KW
200	5000	4	KDPV4200KW
250	5000	4	KDPV4250KW
350	5000	4	KDPV4350KW
400	5000	4	LGPV4400KSW
600	7500	3	MDLPV3600KSW

Notes

- ^① Base mounting hardware is included with a circuit breaker or a molded case switch (included with breaker). If required separately, order 66A2546G02.
- ^② Individually priced.
- ^③ Locks in ON and OFF position.
- ^④ Add 20% to list price.

Internal Accessories—Right Pole Mounting

	FD PV ①		JG PVS		KD PV KD PVS		LG PV		MDL PV	
	Factory Modification Code	Field Kit Catalog Number	Factory Modification Code	Field Kit Catalog Number	Factory Modification Code	Field Kit Catalog Number	Factory Modification Code	Field Kit Catalog Number	Factory Modification Code	Field Kit Catalog Number
Auxiliary Switch										
1A-1B	A06	A1X1PK	A1	AUX1A1BPK	A06	A1X3PK	A1	AUX1A1BPK	A06	A1X4PK
2A-2B	A13	A2X1RPK	A2	AUX2A2BPK	A13	A2X3PK	A2	AUX2A2BPK	A13	A2X4PK
Alarm Switch										
1 make/1 break	B06	A1L1RPK	B1	ALM1M1BJPKL	B06	A1L3RPK	B1	ALM1M1BJPK	B06	A1L4RPK
Auxiliary and Alarm Combo										
1A-1B, 1 make/1 break	C05	AAL1RPK	B2w	AUXALRMJPK	C05	AAL3RPK	B2	AUXALRMJPK	C05	AA114RPK

Internal Accessories—Left Pole Mounting

	FD PV ①		JG PVS		KD PV KD PVS		LG PV		MDL PV	
	Factory Modification Code	Field Kit Catalog Number	Factory Modification Code	Field Kit Catalog Number	Factory Modification Code	Field Kit Catalog Number	Factory Modification Code	Field Kit Catalog Number	Factory Modification Code	Field Kit Catalog Number
Shunt Trip										
12 Vdc	S02	SNT1LP03K	S4	SNT012CPK	S42	SNT3P04K	S4	SNT012CPK	S02	SNT4LP03K
24 Vdc	S02	SNT1LP03K	S1	SNT060CPK	S42	SNT3P04K	S1	SNT060CPK	S02	SNT4LP03K
48 Vdc	S06	SNT1LP08K	S1	SNT060CPK	S50	SNT3P06K	S1	SNT060CPK	S86	SNT4LP23K
60 Vdc	S06	SNT1LP08K	S1	SNT060CPK	S50	SNT3P06K	S1	SNT060CPK	S86	SNT4LP23K
125 Vdc	S10	SNT1LP12K	S5	SNT125DPK	S10	SNT3P11K	S2	SNT120CPK	S42	SNT4LP26K
250 Vdc	S14	SNT1LP18K	—	—	S14	SNT3P14K	—	—	S14	SNT4LP14K
120 Vac	S10	SNT1LP12K	S2	SNT120CPK	S10	SNT3P11K	S2	SNT120CPK	S10	SNT4LP11K
Undervoltage Release										
12 Vdc	U30	UVH1LP20K	—	—	T02	UVH3LP20K	U1	UVR012DPK	T02	UVH4LP20K
24 Vdc	U34	UVH1LP21K	U2	UVR024CPK	T02	UVH3LP21K	U2	UVR024DPK	T06	UVH4LP21K
48 Vdc	U38	UVH1LP22K	U4	UVR048DPK	T10	UVH3LP22K	U4	UVR048DPK	T10	UVH4LP22K
60 Vdc	—	—	U4	UVR048DPK	—	—	—	—	—	—
125 Vdc	U42	UVH1LP26K	U6	UVR125DPK	T14	UVH3LP26K	U6	UVR125DPK	T14	UVH4LP26K
250 Vdc	U46	UVH1LP28K	U8	UVR250DPK	T18	UVH3LP28K	U8	UVR250DPK	T18	UVH4LP28K
120 Vac	U14	UVH1LP08K	U5	UVR120APK	U18	UVH3LP08K	U5	UVR120APK	U18	UVH4LP08K

Notes

① Underwriters Laboratories requires that internal accessories for the FD PV be installed at the factory. Internal accessories are UL listed for factory installation under E7819. Where local codes and standards permit and UL listing is not required, internal accessories can be field installed. Accessory installation should be done before the circuit breaker is mounted and connected.

One accessory can be mounted per pole, per breaker.

3.2

PVGard Solar Circuit Breakers

Specialty Breakers

PVGard Solar Circuit Breaker Terminal Offering

Breaker Frame	Maximum Breaker Ampacity	Terminal Body Material	Wire Type	AWG Wire Range/ Number of Conductors	Metric Wire Range mm ²	Number of Terminals Included	Standard Terminal Catalog Number	Comments
FD PV	50	Steel	Cu/Al	14–4 (1)	2.5–25 (1)	3	3TA50FB	
	100	Aluminum	Cu/Al	6–300 kcmil (1)	16–150 (1)	3	3TA225FDK	Includes 3P terminal cover
	100	Copper	Cu	4–4/0 (1)	25–95 (1)	3	3T225FD	
JG PVS	250	Aluminum	Cu/Al	#8–350 kcmil (1)	—	—	TA250FJ	
	250	Aluminum	Cu/Al	(2) 2/0–(2) 4/0	—	①	3TA251FJK1	
	250	Aluminum	Cu/Al	(2) 2/0–(2) 4/0	—	②	3TA251FJK2	
	250	Copper	Cu	#4–350 kcmil (1)	—	—	T250FJ	
KD PV KD PVS	225	Aluminum	Cu/Al	3–350 kcmil (1)	35–185 (1)	1	TA300K	
	250	Aluminum	Cu/Al	250–500 kcmil (1)	120–240 (1)	1	TA350K	
	250	Aluminum	Cu/Al	3/0–250 kcmil (2)	95–120 (1)	4	4TA400K	Contains interphase barriers
	250	Aluminum	Cu/Al	2/0–250 kcmil (2) or 2/0–500 kcmil (1)	70–240 (2)	4	4TA401K	
	300	Aluminum	Cu/Al	3/0–250 kcmil (2)	95–120 (2)	4	4TA401K	Contains interphase barriers
	350	Aluminum	Cu/Al	3/0–250 kcmil (2)	95–120 (2)	4	4TA401K	Contains interphase barriers
	225	Copper	Cu	3–350 kcmil (1)	35–185 (1)	1	T300K	
	250	Copper	Cu	250–500 kcmil (1)	120–240 (1)	1	T350K	
	250	Copper	Cu	3/0–250 kcmil (2)	95–120 (1)	4	4T400K	Contains interphase barriers
	300	Copper	Cu	3/0–250 kcmil (2)	95–120 (2)	4	4TA401K	Contains interphase barriers
	350	Copper	Cu	3/0–250 kcmil (2)	95–120 (2)	4	4TA401K	Contains interphase barriers
	400	Aluminum	Cu/Al	2–500 kcmil (2)	35–240 (2)	4	4TA632LK	Includes 4P terminal cover
	250	Copper	Cu	2–500 kcmil (1)	35–240 (1)	1	T350LK	
LG PV	400	Copper	Cu	2–500 kcmil (2)	35–240 (2)	4	4T632LK	Includes 4P terminal cover
	400	Copper	Cu	2–500 kcmil (2)	35–240 (2)	4	4T632LK	Includes 4P terminal cover
MDL PV	300	Aluminum	Cu/Al	1–500 kcmil (2)	—	1	TA700MA1	
	600	Aluminum	Cu/Al	3/0–400 kcmil (3)	—	1	TA800MA2	

Endcap Kits

Breaker Frame	Number of Poles	Thread Type	Thread Size	Catalog Number
FD PV	4	Imperial	10–32	KPEK14
	4	Metric	M–5	KPEKM14
JG PVS	3	Imperial	—	FJ3RTDK
	3	Metric	—	FJ3RTWK
KD PV	4	Imperial	0.312–18	KPEK34
	4	Metric	M–8	KPEKM34
KD PVS	3	Imperial	—	KPEK3
	3	Metric	—	KPEKM3
LG PV	4	Imperial	—	N/A
	4	Metric	M-10	L4RTWK
MDL PV	3	Imperial	—	—
	3	Metric	—	—

Notes

- ① Three terminals with terminal shield as a kit.
 ② Three terminals with two interphase barriers as a kit.

Jumpers

Jumpers must be ordered separately. Priced individually.

FD PV Frame

Description	Maximum Amperes	Catalog Number
Single copper jumper	60	DC1F060 ^①
	100	DC1F100 ^①
	125	DC1F125 ^①
	225	DC1F225 ^①
Package of 2 aluminum jumpers	100	DC2FD100A
Package of 3 aluminum jumpers	100	DC3FD100A

JG PVM, JG PVMD Frames

Description	Maximum Amperes	Catalog Number
Single aluminum jumper	250	DC1JG250A ^①
Package of 2 aluminum jumpers	250	DC2JG250A ^①
Package of 20 aluminum jumpers	250	DC20JG250A ^①

KD PV, KD PVM, KD PVMD Frames

Description	Maximum Amperes	Catalog Number
Single copper jumper	400	DC1K400 ^①
Package of 2 aluminum jumpers	400	DC2KD400A ^①
Package of 3 aluminum jumpers	400	DC3KD400A ^①

LG PV Frame

Description	Maximum Amperes	Catalog Number
Package of 2 aluminum jumpers	400	DC2LG400A
Package of 3 aluminum jumpers	400	DC3LG400A
Package of 30 aluminum jumpers	400	DC30LG400A

Note

^① Not UL Listed; Non UL listed jumpers used in a UL application may need to be qualified by the OEM in their assembly. This may take place with UL or another certified testing agency.

Technical Data and Specifications

- Thermal-magnetic circuit breakers
- Designed to meet UL 489B for solar photovoltaic circuit protection
- 100% rated of the continuous current rating
- 50°C calibrated
- Can be applied in grounded, ungrounded or bi-polar systems
- Ability to open on signal from DC arc or ground fault detector
- Two PVGard lineups
 - UL File EE350638, Category Control Number DIUR
 - 600 Vdc per-pole breaker and switch
 - Each pole rated 600 Vdc
 - 1000 Vdc poles-in-series breaker and switch
 - Requires poles in series connection

**Quick Reference PVGard Solar Circuit Breakers
600 Vdc Per-Pole****PVGard 600 Vdc Current Ratings by Frame
UL 489B Interrupting Capacity (kA) 600 Vdc Per-Pole**

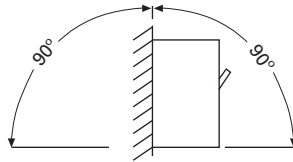
Circuit Breaker Type	Minimum Amperes	Maximum Amperes	kA Rating
JG PVS	90	250	1.2
KD PVS	100	400	3

**Quick Reference PVGard Solar Circuit Breakers
1000 Vdc Poles-in-Series****PVGard 1000 Vdc Current Ratings by Frame
UL 489B Interrupting Capacity (kA) 1000 Vdc**

Circuit Breaker Type	Minimum Amperes	Maximum Amperes	kA Rating	Poles in Series
FD PV	30	100	3	4
KD PV	125	350	5	4
LG PV	250	400	5	4
MDL PV	300	600	7.5	3

PVGard 600 Vdc Per-Pole Solar PV Circuit Breakers (100% and 80% Rated Frames)

	JG PVS	KD PVS
Number of 600 Vdc circuits	3	3
Maximum voltage rating	600 Vdc	600 Vdc
Ampere range	90–250A	100–400A
Interrupting capacity at 600 Vdc	1.2 kA	3 kA
Time constant	1 ms	1 ms
Trip unit type	Thermal-magnetic	Thermal-magnetic
Rated impulse withstand voltage		
Main conducting paths	8 kV	8 kV
Auxiliary circuits	4 kV	4 kV
Endurance		
Mechanical operations	10,000	6000
Electrical operations	400	400
Maximum switching frequency	240 per hour	240 per hour
Third-party certification	UL 489B	UL 489B
Environment		
Design ambient temperature	50°C	50°C
Maximum current at 60°C, as % of rated current	93%	93%
Maximum current at 70°C, as % of rated current	85%	85%
Operating temperature range	–20°C to +50°C	–20°C to +50°C
Storage temperature range	–20°C to +70°C	–20°C to +70°C
Suitable for freeze temperatures to –40°C	Option	Option
Relative humidity	0 to 95% noncondensing	0 to 95% noncondensing
Suitable for reverse-feed applications	Yes	Yes
Mounting—permissible mounting position		



Connection diagrams

Terminations

Al/Cu wire	TA250FJ: (1) #8–350 kcmil	TA300K: (1) #3–350 kcmil
	3TA251FJK1: (2) 2/0–(2) 4/0 ②	TA350K: (1) 250–500 kcmil
	3TA251FJK2: (2) 2/0–(2) 4/0 ③	TA403K: (2) 1/0–400 kcmil
Cu wire		3TA402K: (1) 500–750 kcmil ④
	T250FJ: (1) #4–350 kcmil	T300K: (1) #3–350 kcmil
Dimensions in inches (mm)		
Height	7.00 (177.8)	10.13 (257.3)
Width	4.13 (104.9)	5.50 (139.7)
Depth	3.57 (90.7)	4.10 (104.1)
Weight in lbs	6.6	11.42

Notes

- ① Line/top side connection only PVGard FD PVS breakers.
- ② Three terminals with terminal shield as a kit.
- ③ Three terminals with two interphase barriers as a kit.
- ④ Not UL 489B recognized size for maximum of 400A breaker.

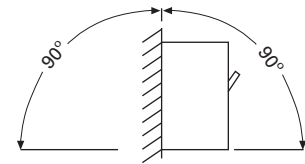
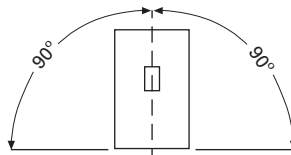
3.2

PVGard Solar Circuit Breakers

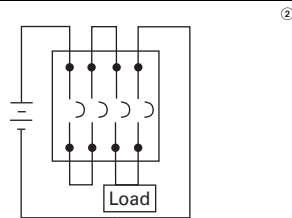
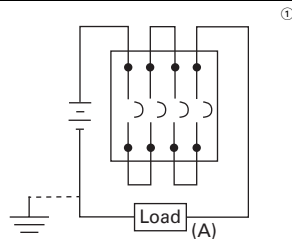
Specialty Breakers

PVGard 1000 Vdc Solar PV Circuit Breakers (100% and 80% Rated Frames)

	FD PV	KD PV	LG PV	MDL PV
Number of poles	4	4	4	3
Maximum voltage rating	1000 Vdc	1000 Vdc	1000 Vdc	1000 Vdc
Maximum current rating	100A	350A	400A	600A
Interrupting capacity at 1000 Vdc	3 kA	5 kA	5 kA	7.5 kA
Time constant	1 ms	1 ms	1 ms	1 ms
Ampere range	15–100A	125–350A	250–400A	300–600A
Trip unit type	Thermal-magnetic	Thermal-magnetic	Thermal-magnetic	Thermal-magnetic
Rated impulse withstand voltage				
Main conducting paths	8 kV	8 kV	8 kV	8 kV
Auxiliary circuits	4 kV	4 kV	4 kV	4 kV
Endurance				
Mechanical operations	10,000	10,000	8000	8000
Electrical operations	1000	400	400	400
Maximum switching frequency	300 per hour	240 per hour	240 per hour	240 per hour
Third-party certification	UL 489B	UL 489B	UL 489B	UL 489B
Environment				
Design ambient temperature	50°C	50°C	50°C	50°C
Maximum current at 60°C, as % of rated current	91%	91%	93%	93%
Maximum current at 70°C, as % of rated current	88%	88%	88%	88%
Operating temperature range	–20°C to +50°C	–20°C to +50°C	–20°C to +50°C	–20°C to +50°C
Storage temperature range	–20°C to +70°C	–20°C to +70°C	–20°C to +70°C	–20°C to +70°C
Suitable for freeze temperatures to –40°C	Option	Option	Option	Option
Relative humidity	0 to 95% noncondensing	0 to 95% noncondensing	0 to 95% noncondensing	0 to 95% noncondensing
Suitable for reverse-feed applications	Yes	Yes	Yes	Yes
Mounting—permissible mounting position				



Connection diagrams



Terminations

Al/Cu wire	#6–300 kcmil	(2) 3/0–250 kcmil	(2) #2–500 kcmil	(3) 3/0–400 kcmil
Cu wire	#4–4/0	(2) 3/0–250 kcmil	(2) #2–500 kcmil	(3) 3/0–300 kcmil

Dimensions in inches (mm)

Height	6.00 (152.4)	10.13 (257.3)	10.13 (257.3)	16.00 (406.4)
Width	5.50 (139.7)	7.22 (183.4)	7.22 (183.4)	8.25 (209.5)
Depth	3.38 (85.9)	4.09 (103.9)	4.09 (103.9)	4.06 (103.1)
Weight in lbs	6	20	20	29

Notes

- ① Suitable for use on ungrounded systems, or grounded systems that have one end of load (A) connected to grounded terminal, opposite poles in series connection.
- ② Suitable for use on ungrounded systems only.

Dimensions

Approximate Dimensions in Inches (mm)

PVGard Solar Circuit Breakers—600 Vdc Per-Pole

Frame	Number of Circuits in a Frame	Width	Height	Depth
JG PVS	3	4.13 (104.9)	7.00 (177.8)	3.44 (87.4)
KD PVS	3	5.49 (139.4)	10.13 (257.2)	4.31 (109.6)

PVGard Solar Circuit Breakers—1000 Vdc Poles-in-Series

Frame	Number of Poles	Width	Height	Depth
FD PV	4	5.50 (139.7)	6.00 (152.4)	3.38 (86.0)
KD PV	4	7.22 (183.4)	10.13 (257.3)	4.09 (103.9)
LG PV	4	7.22 (183.4)	10.13 (257.3)	4.09 (103.9)
MDL PV	3	8.25 (209.6)	16.00 (406.4)	4.06 (103.1)

3.2

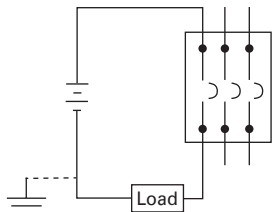
PVGard Solar Circuit Breakers

Specialty Breakers

Wiring Diagrams

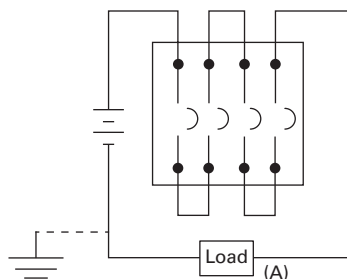
Series Connection Diagrams for DC Application ^{①②}

JF PVS, KD PVS—600 Vdc Per-Pole

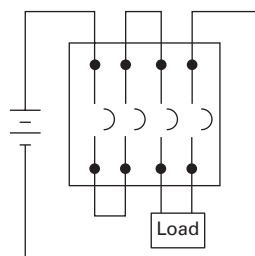


Suitable for grounded or ungrounded systems.
Suitable for quantity (3) 600 Vdc circuits.

FD PV, KD PV, LG PV—1000 Vdc Maximum—Four Poles-in-Series

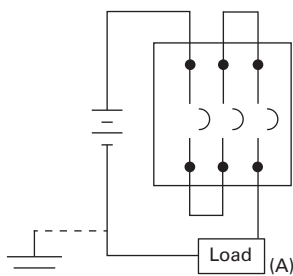


Suitable for use on ungrounded systems, or grounded systems that have one end of load (A) connected to grounded terminal, opposite poles in series connection.

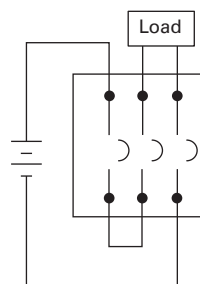


Suitable for use on ungrounded systems only.

MDL PV—1000 Vdc Maximum—Three Poles in Series



Suitable for use on ungrounded systems, or grounded systems that have one end of load (A) connected to grounded terminal, opposite poles in series connection.



Suitable for use on ungrounded systems only.

Notes

- ① Poles in series connection is customer supplied. Use rated cable per NEC.
- ② For grounded systems, all poles in series must be connected on non-grounded terminal, with load connected to grounded terminal.

DC Switch Disconnectors



Contents

Description

DC Switch Disconnectors	
Product Selection	V15-T3-30
Technical Data and Specifications	V15-T3-34
Dimensions	V15-T3-37

DC Switch Disconnectors

Product Description

Switch disconnectors N...DC in the special version for up to 1500 Vdc can be used on single- or two-poles. They comply with the isolation properties for earthed IT networks. Accessories, such as bridge kits, connection terminals and door coupling rotary handles, enable individual installation in the most varied types of distribution systems. Auxiliary switches, voltage releases and remote operators facilitate signalling and automation.

Application Description

- Switch disconnectors for nominal system voltage up to 1500 Vdc
- Suitable for cabinets with ambient temperatures up to 70°C
- Main switch before DC/AC converter fulfills NEC requirements
- Safely switching in combiner boxes enables effective operation in case of maintenance with breaking capacity under load up to 4x nominal current
- Bi-directional functionality of switch contacts for array protection suitable for grounded or ungrounded systems

Features

- Switch disconnectors N can be combined with voltage releases NZM...-XU, NZM...-XA and auxiliary contacts, as well as with remote operator NZM...-XR
- For DC switching, series connection of all four current paths is needed
- Standard equipment: screw-type connection, frame terminal available as an option
- For non-earthed networks (e.g., IT), the installation must be configured such that the likelihood of a double earth fault is negligibly small
- Switches can not be combined with withdrawable units and/or connection on rear
- N4-4...S15-DC supply from the bottom only

Standards and Certifications

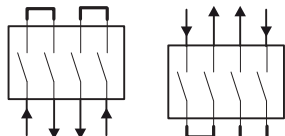
- IEC/EN 60947-3
- Main switch characteristics including positive drive to IEC/EN 60204 and VDE 0113
- Isolating characteristics to IEC/EN 60947 and VDE 0660
- Busbar tag shroud to VDE 0160 Part 100

Product Selection

3

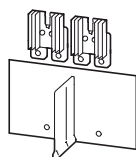
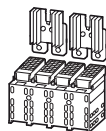
Switch Disconnectors for 1000/1500 Vdc, Single- and Two-Pole

	Rated Operational Current Rated = Uninterrupted Current $I_n = I_u$	Short-Circuit Protective Device Fuse gR-Characteristic	Screw Connection	Units per Package	1000 Vdc Fixed Mounted Catalog Number	1500 Vdc Fixed Mounted Catalog Number
N2-4 	160A	200A	S	1	N2-4-160-S1-DC	N2-4-160-S15-DC
	200A	200A	S	1	N2-4-200-S1-DC	N2-4-200-S15-DC
	250A	200A	S	1	N2-4-250-S1-DC	N2-4-250-S15-DC
N3-4 	320A	500A	S	1	N3-4-320-S1-DC	N3-4-320-S15-DC
	400A	500A	S	1	N3-4-400-S1-DC	N3-4-400-S15-DC
	500A	500A	S	1	N3-4-500-S1-DC	N3-4-500-S15-DC
	550A	500A	S	1	N3-4-550-S1-DC	N3-4-550-S15-DC
N4-4 	800A	—	S	1	N4-4-800-S1-DC	N4-4-800-S15-DC
	1000A	—	S	1	N4-4-1000-S1-DC	N4-4-1000-S15-DC
	1250A	—	S	1	N4-4-1250-S1-DC	N4-4-1250-S15-DC
	1400A	—	S	1	N4-4-1400-S1-DC	N4-4-1400-S15-DC
	1600A	—	S	1	N4-4-1600-S1-DC	N4-4-1600-S15-DC

Bridge Kits**Two-Pole (+ and –) on One Side**

- Model contains parts for upper or lower row of switchgear side for four-pole switches N...-S1(S15)-DC that are used as two-pole switches for DC
- Each link connects two contacts in series
- Incoming unit and outgoing at bottom according to the switching diagrams
- N4-4-... ≥1250A at 65°C alternate connection at bottom through module plates NZM4-4-XKM2S-1600
- N4-4-...S15-DC supply from the bottom only

3

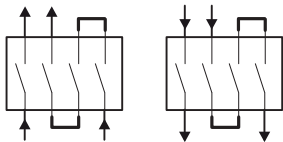
Bridge Kits NZM...-XKV...2P...**Bridge Kits**

Rated Operational Current I_n	Protection Class	For Use With	Units Per Package	Catalog Number
Including Cover				
225A at 40°C 170A at 65°C	IP2X	N2-4-...S1-(S15)-DC	1	NZM2-4-XKV2P
250A at 40°C 190A at 65°C	IP2X	N2-4-...S1-(S15)-DC	1 ①	NZM2-4-XKV2P-K
517A at 40°C 435A at 65°C	IP2X	N3-4-...S1-(S15)-DC	1	NZM3-4-XKV2P
550A at 40°C 468A at 65°C	IP2X	N3-4-...S1-(S15)-DC	1 ①	NZM3-4-XKV2P-K
1400A at 40°C 1260A at 65°C	IP2X	N4-4-...S1-(S15)-DC	1	NZM4-4-XKV2P
Including Insulation Plates and Phase Separator				
238A at 40°C 180A at 65°C	IP00	N2-4-...S1-(S15)-DC	1	NZM2-4-XKVI2P
250A at 40°C 213A at 65°C	IP00	N2-4-...S1-(S15)-DC	1 ①	NZM2-4-XKVI2P-K
534A at 40°C 451A at 65°C	IP00	N3-4-...S1-(S15)-DC	1	NZM3-4-XKVI2P
550A at 40°C 501A at 65°C	IP00	N3-4-...S1-(S15)-DC	1 ①	NZM3-4-XKVI2P-K
1600A at 40°C 1500A at 65°C	IP00	N4-4-...S1-(S15)-DC	1 ①	NZM4-4-XKVI2P-K

Note

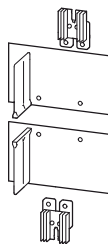
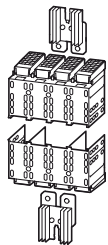
① Includes cooling unit.

Detailed assignment taking into account ambient temperature, degree of protection and fitting position as listed in tables on **Pages V15-T3-34 and V15-T3-35**.

**Two-Pole (+ and –)
Double Sided**

- Each link connects three contacts in series
- Incoming unit and outgoing at bottom or top, according to the switching diagrams

- Model contains parts for upper and lower row of switchgear side for four-pole switches N...-S1(S15)-DC that are used as two-pole switches for DC

Bridge Kits**Bridge Kits NZM...-XKV...2POU...**

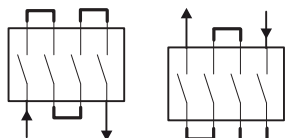
Rated Operational Current I_n	Protection Class	For Use With	Units Per Package	Catalog Number
Including Cover				
200A at 40°C 160A at 65°C	IP2X	N2-4-...S1-(S15)-DC	1	NZM2-4-XKV2POU
225A at 40°C 170A at 65°C	IP2X	N2-4-...S1-(S15)-DC	1 ①	NZM2-4-XKV2POU-K
400A at 40°C 388A at 65°C	IP2X	N3-4-...S1-(S15)-DC	1	NZM3-4-XKV2POU
517A at 40°C 435A at 65°C	IP2X	N3-4-...S1-(S15)-DC	1 ①	NZM3-4-XKV2POU-K
Including Insulation Plates and Phase Separator				
213A at 40°C 160A at 65°C	IP00	N2-4-...S1-(S15)-DC	1	NZM2-4-XKVI2POU
238A at 40°C 180A at 65°C	IP00	N2-4-...S1-(S15)-DC	1 ①	NZM2-4-XKVI2POU-K
501A at 40°C 418A at 65°C	IP00	N3-4-...S1-(S15)-DC	1	NZM3-4-XKVI2POU
534A at 40°C 451A at 65°C	IP00	N3-4-...S1-(S15)-DC	1 ①	NZM3-4-XKVI2POU-K

Note

① Includes cooling unit.

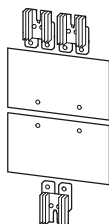
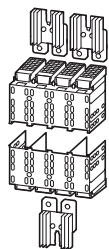
Detailed assignment taking into account ambient temperature, degree of protection and fitting position as listed in tables on **Pages V15-T3-34 and V15-T3-35**.

Single-Pole (+ and -) Double Sided



- Each link connects four contacts in series (plus or minus)
- Incoming unit and outgoing at bottom or top, according to the switching diagrams
- Model contains parts for upper and lower row of switchgear side for four-pole switches N...-S1(S15)-DC that are used as single-pole switches for DC

Bridge Kits



Bridge Kits NZM...-XKV...1P...

Rated Operational Current I _n	Protection Class	For Use With	Units Per Package	Catalog Number
Including Cover				
200A at 40°C 160A at 65°C	IP2X	N2-4-160(200)-S1-(S15)-DC	1	NZM2-4-XKV1P
225A at 40°C 170A at 65°C	IP2X	N2-4-...S1-(S15)-DC	1 ①	NZM2-4-XKV1P-K
400A at 40°C 388A at 65°C	IP2X	N3-4-320-S1-(S15)-DC	1	NZM3-4-XKV1P
517A at 40°C 435A at 65°C	IP2X	N3-4-400(500)-S1-(S15)-DC	1 ①	NZM3-4-XKV1P-K
Including Insulation Plates				
213A at 40°C 160A at 65°C	IP00	N2-4-...S1-(S15)-DC	1	NZM2-4-XKV1P
238A at 40°C 180A at 65°C	IP00	N2-4-200(250)-S1-(S15)-DC	1 ①	NZM2-4-XKV1P-K
501A at 40°C 418A at 65°C	IP00	N3-4-...S1-(S15)-DC	1	NZM3-4-XKV1P
534A at 40°C 451A at 65°C	IP00	N3-4-500(550)-S1-(S15)-DC	1 ①	NZM3-4-XKV1P-K

Note

① Includes cooling unit.

Detailed assignment taking into account ambient temperature, degree of protection and fitting position as listed in tables on **Pages V15-T3-34 and V15-T3-35**.

Technical Data and Specifications

Reduction of the rated operating current (derating) at different ambient temperatures, fitting positions, degrees of protection and jumper kits.

3

Temperature Impact, Derating

			Rated Operating Current Amperes											
Load Disconnect Switch	Touch Protection	Jumper Kit	Fitting Position Load Disconnect Switch											
				20°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C	70°C	
N2-4-160-S1(15)-DC	IP2X	NZM2-4-XKV2P NZM2-3-XKV2POU-K NZM2-3-XKV1P-K	Vertical	160	160	160	160	160	160	160	160	160	160	
	IP00	NZM2-4-XKV2P NZM2-3-XKV2POU-K NZM2-3-XKV1P-K	Horizontal	160	160	160	160	160	160	160	160	160	160	
	IP2X	NZM2-3-XKV1P-K NZM2-4-XKV2P	Vertical	160	160	160	160	160	160	160	160	160	152	
			Vertical	160	160	160	160	160	160	160	160	152	144	
N2-4-200-S1(15)DC	IP00	NZM2-4-XKV2P-K	Vertical	200	200	200	200	200	200	200	200	200	200	
			Horizontal	200	200	200	200	200	200	200	200	200	190	
	IP2X	NZM2-4-XKV2P-K	Vertical	200	200	200	200	200	200	200	200	190	180	
	IP00	NZM2-4-XKV2P NZM2-4-XKV2POU-K NZM2-4-XKV1P-K	Horizontal	200	200	200	200	200	200	200	190	180	170	
	IP2X	NZM2-4-XKV2P NZM2-4-XKV2POU-K NZM2-4-XKV1P-K	Vertical	200	200	200	200	200	200	190	180	170	160	
			Horizontal	200	200	200	200	200	190	180	170	160	—	
	IP2X	NZM2-4-XKV2POU NZM2-4-XKV1P	Vertical	200	200	200	200	190	180	170	160	—	—	
			Horizontal	200	200	200	190	180	170	160	—	—	—	
N2-4-250-S1(15)-DC	IP00	NZM2-4-XKV2P-K	Vertical	250	250	250	250	250	250	238	225	213	200	
			Horizontal	250	250	250	250	250	238	225	213	200	—	
	IP2X	NZM2-4-XKV2P-K	Horizontal	250	250	250	250	238	225	213	200	—	—	
	IP00	NZM2-4-XKV2P NZM2-4-XKV2POU-K NZM2-4-XKV1P-K	Horizontal	250	250	250	238	225	213	200	—	—	—	
	IP2X	NZM2-4-XKV2P NZM2-4-XKV2POU-K NZM2-4-XKV1P-K	Vertical	250	250	238	225	213	200	—	—	—	—	
			Horizontal	250	238	225	213	200	—	—	—	—	—	

Temperature Impact, Derating, continued

Load Disconnect Switch	Touch Protection	Jumper Kit	Fitting Position Load Disconnect Switch	Rated Operating Current Amperes									
				20°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C	70°C
N3-4-320-S1(15)-DC	IP2X	NZM3-4-XKV2P NZM3-4-XKV2POU NZM3-4-XKV1P	Vertical	320	320	320	320	320	320	320	320	320	320
	IP00	NZM3-4-XKV12P NZM3-4-XKV12POU NZM3-4-XKV11P	Horizontal	320	320	320	320	320	320	320	320	320	320
N3-4-400-S1(15)-DC	IP2X	NZM3-4-XKV2P NZM3-4-XKV2POU-K NZM3-4-XKV1P-K	Vertical	400	400	400	400	400	400	400	400	400	400
	IP00	NZM3-4-XKV12P NZM3-4-XKV12POU NZM3-4-XKV11P	Horizontal	400	400	400	400	400	400	400	400	400	388
	IPX2	NZM3-4-XKV2POU	Vertical	400	400	400	400	400	400	400	400	388	—
		NZM3-4-XKV1P	Horizontal	400	400	400	400	400	400	400	388	376	—
N3-4-500-S1(15)-DC	IP00	NZM3-4-XKV12P-K	Vertical	500	500	500	500	500	500	485	470	455	440
			Horizontal	500	500	500	500	500	485	470	455	440	425
	IP2X	NZM3-4-XKV2P-K	Vertical	500	500	500	500	485	470	455	440	425	410
	IP00	NZM3-4-XKV12P NZM3-4-XKV12POU-K NZM3-4-XKV11P-K	Horizontal	500	500	500	485	470	455	440	425	410	400
	IP2X	NZM3-4-XKV2P NZM3-4-XKV2POU-K NZM3-4-XKV1P-K	Vertical	500	500	485	470	455	440	425	410	400	—
	IP00	NZM3-4-XKV12POU NZM3-4-XKV11P	Horizontal	500	485	470	455	440	425	410	400	—	—
N3-4-550-S1(15)-DC	IP00	NZM3-4-XKV12P-K	Vertical	550	550	550	550	550	550	534	517	501	484
			Horizontal	550	550	550	550	550	534	517	501	484	468
	IP2X	NZM3-4-XKV2P-K	Vertical	550	550	550	550	534	517	501	484	468	451
	IP00	NZM3-4-XKV12P NZM3-4-XKV12POU-K NZM3-4-XKV11P-K	Horizontal	550	550	550	534	517	501	484	468	451	435
	IP2X	NZM3-4-XKV2P NZM3-4-XKV2POU-K NZM3-4-XKV1P-K	Vertical	550	550	534	517	501	484	468	451	435	418
	IP00	NZM3-4-XKV12POU NZM3-4-XKV11P	Horizontal	550	534	517	501	484	468	451	435	418	402
N4-4-800-S1(15)-DC	IP2X	NZM4-4-XKV2P	Vertical	800	800	800	800	800	800	800	800	800	800
			Horizontal	800	800	800	800	800	800	800	800	800	800
N4-4-1000-S1(15)-DC	IP2X	NZM4-4-XKV2P	Vertical	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
			Horizontal	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
N4-4-1250-S1(15)-DC	IP2X	NZM4-4-XKV2P	Vertical	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250
			Horizontal	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250
N4-4-1400-S1(15)-DC	IP00	NZM4-4-XKV2P-K	Vertical	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
			Horizontal	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
	IP2X	NZM4-4-XKV2P	Vertical	1400	1400	1400	1400	1358	1330	1302	1274	1260	—
			Horizontal	1400	1400	1400	1358	1330	1302	1274	1260	—	—
N4-4-1600-S1(15)-DC	IP00	NZM4-4-XKV2P-K	Vertical	1600	1600	1600	1600	1576	1552	1528	1512	1500	1472
			Horizontal	1600	1600	1600	1576	1552	1528	1512	1500	1472	1448

3.3

DC Switch Disconnectors

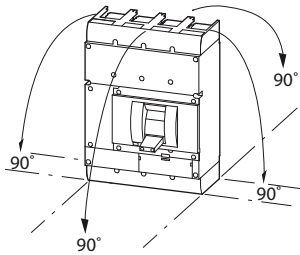
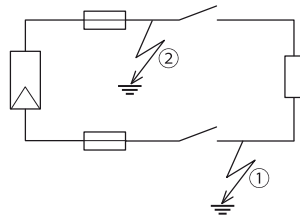
Switch Disconnectors 1000 Vdc

Description			N2-4-...-S1-DC Max. 250A			N3-4-...-S1-DC Max. 550A				N4-4-...-S1-DC Max. 1600A			
Rated operational voltage	U_e	Vdc	1000			1000				1000			
Rated insulation voltage	U_i	Vdc	1000			1000				1000			
Rated impulse withstand voltage	U_{imp}												
Main contacts		V	8000			8000				8000			
Auxiliary contacts		V	6000			6000				6000			
Category of utilization			DC-22A			DC-22A				DC-22A			
Rated uninterrupted current with terminal jumpers	I_u												
at 40°C		A	250			550				1600			
at 65°C		A	250			500				1500			
Rated operating current	I_e	A	250			550				1600			
Rated switch-on and switch-off capacity	I_{cw}	A	1200			2200				6400			
Rated short-time withstand current t = 1s		kA	3, 6			6, 6				25 (0, 1s)			
Rated conditional short-circuit current	I_q	kA	15			15				—			
With backup fuse up to 1000V		A gR/gPV	200			2 x 250				—			
Maximum operating frequency	S/h		120			60				60			
Lifespan													
Mechanical	Operations		20,000			15,000				10,000			
Electrical (of which max. 50% trip by N/U release)	Operations		1000			1000				500			
Overvoltage category			III			III				III			
Degree of pollution			3			3				3			
Power loss at rated current	I_u	A	160	200	250	320	400	500	550	800	1000	1250	1600
Load disconnect switch	P	W	27	42	66	62	96	150	182	81	127	177	290
Jumper kit for each jumper fitted	P	W	1	1, 5	2	4	6	9, 5	11	0, 6	1	1, 6	2, 6

Switch Disconnectors 1500 Vdc

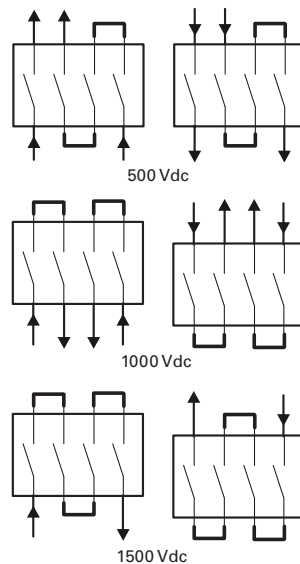
Description			N2-4-...-S15-DC Max. 250A			N3-4-...-S15-DC Max. 550A				N4-4-...-S15-DC Max. 1600A			
Rated operational voltage	U_e	Vdc	1500			1500				1500			
Rated insulation voltage	U_i	Vdc	1500			1500				1500			
Rated impulse withstand voltage	U_{imp}												
Main contacts		V	10,000			10,000				10,000			
Auxiliary contacts		V	6000			6000				6000			
Category of utilization			DC-22A			DC-22A				DC-22A			
Rated uninterrupted current with terminal jumpers	I_u												
at 40°C		A	250			550				1600			
at 65°C		A	250			500				1500			
Rated operating current	I_e	A	250			550				1600			
Rated switch-on and switch-off capacity	I_{cw}	A	1200			2200				6400			
Rated short-time withstand current t = 1s		kA	3, 6			6, 6				25 (0, 1s)			
Maximum operating frequency	S/h		120			60				60			
Lifespan													
Mechanical	Operations		20,000			15,000				10,000			
Electrical (of which max. 50% trip by N/U release)	Operations		1000			1000				500			
Overvoltage category			III			III				III			
Degree of pollution			2			2				3			
Power loss at rated current	I_u	A	160	200	250	320	400	500	550	800	1000	1250	1600
Load disconnect switch	P	W	27	42	66	62	96	150	182	81	127	177	290
Jumper kit for each jumper fitted	P	W	1	1, 5	2	4	6	9, 5	11	0, 6	1	1, 6	2, 6

Note: N...S1-DC and N...S15-DC cannot be combined with plug-in or withdrawable units and/or in case of rear connection.

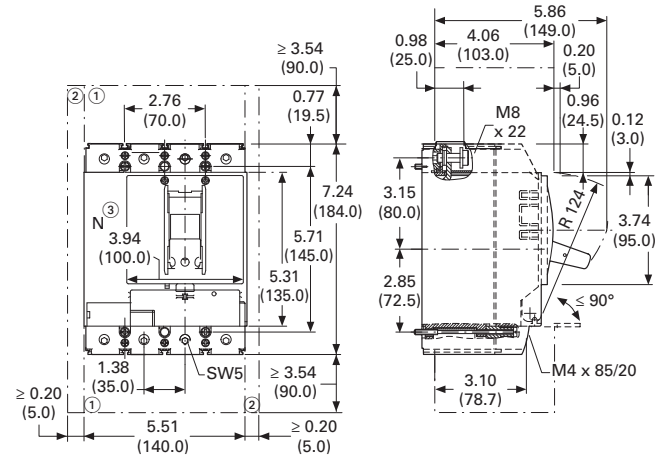
Central Fitting Position**IT Network Including the Possibility of a Double-Ground Fault**

In ungrounded networks (for example, IT) the installation has to be done in a way to keep the likelihood of a double-ground fault neglectably low.

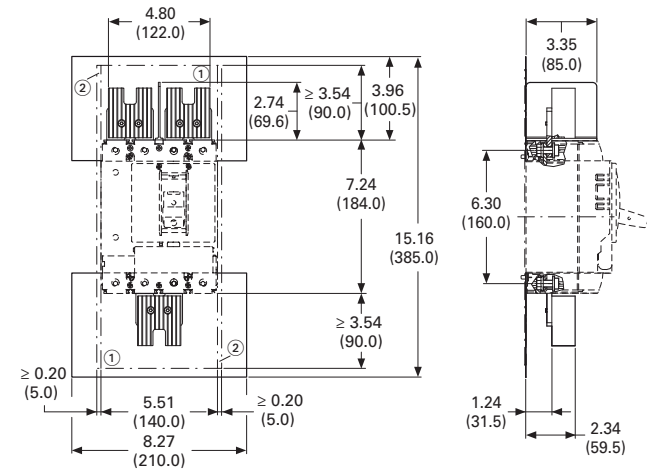
Depending on the use of jumper kits and on the layout of the single- or two-pole circuit, the following maximum rated operating voltage levels have to be respected to make sure that—even in case of a double-ground fault—safe switch-on and switch-off is possible in accordance with utilization category DC22-A.

**Rated Operating Voltage
 U_e Maximum IT Network****Dimensions**

Approximate Dimensions in Inches (mm)

Switch Disconnectors, Four-Pole N2-4...DC

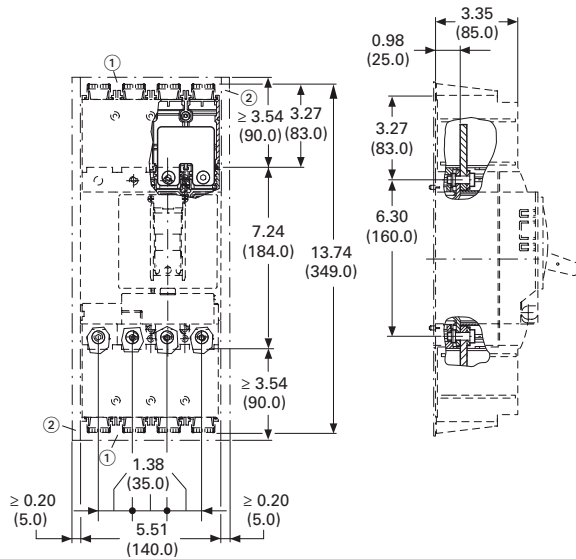
- ① Blowout area, minimum clearance to other parts.
- ② Minimum clearance to adjacent parts.

Jumper Kit, NZM2-4-XKVI...

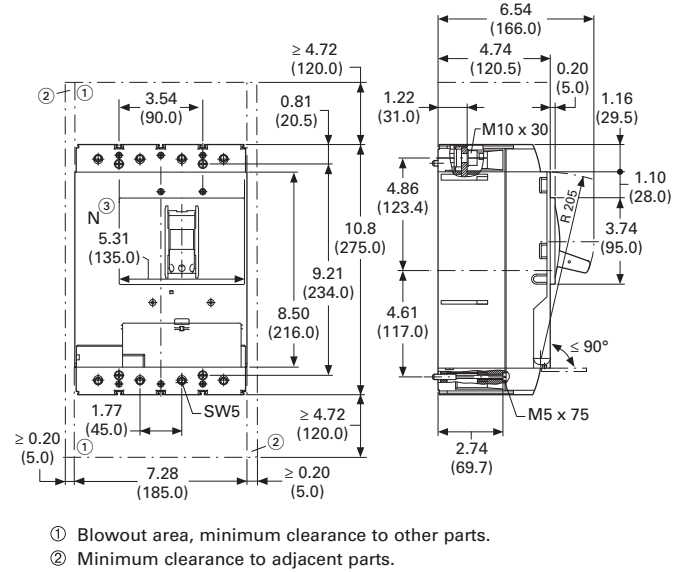
3.3 DC Switch Disconnectors

Approximate Dimensions in Inches (mm)

Jumper Kit, NZM2-4-XKV...

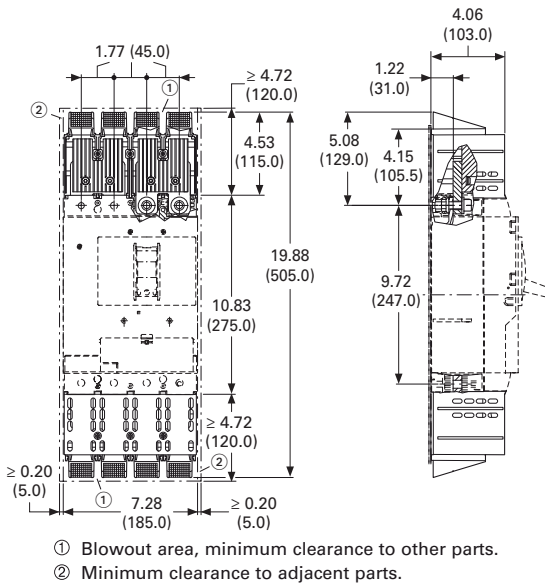


Switch Disconnectors, Four-Pole, N3-4...DC



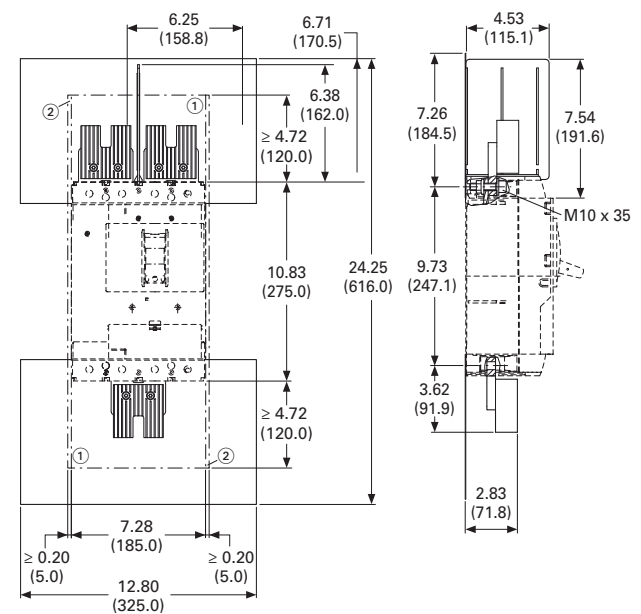
- ① Blowout area, minimum clearance to other parts.
- ② Minimum clearance to adjacent parts.

Jumper Kit, NZM3-4-XKV...



- ① Blowout area, minimum clearance to other parts.
- ② Minimum clearance to adjacent parts.

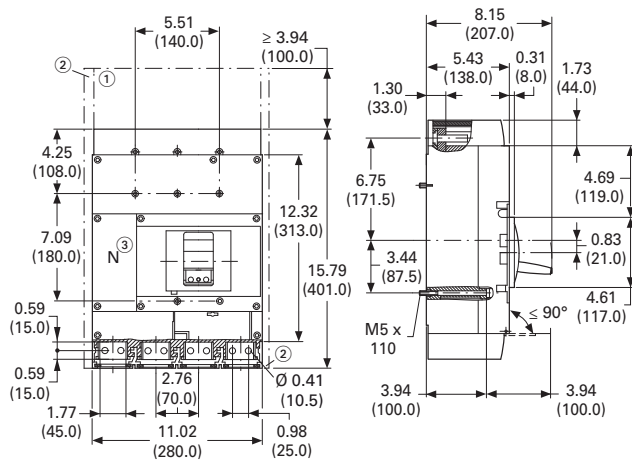
Jumper Kit, NZM3-4-XKVI...



- ① Blowout area, minimum clearance to other parts.
- ② Minimum clearance to adjacent parts.

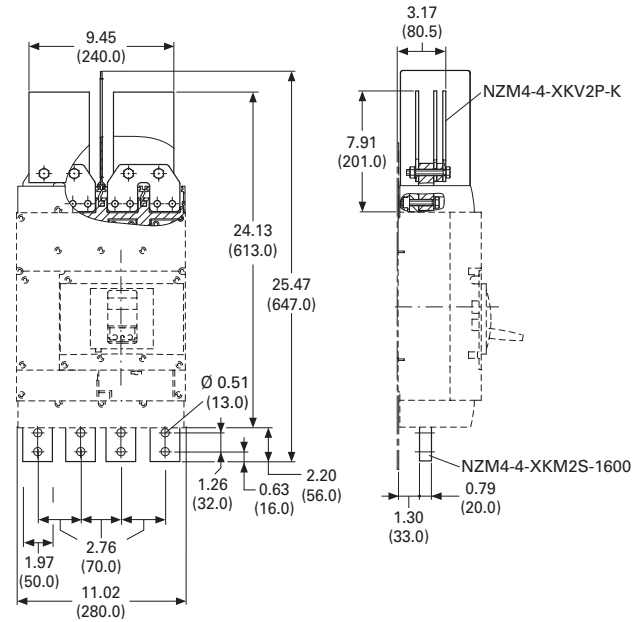
Approximate Dimensions in Inches (mm)

Switch Disconnectors, Four-Pole, N4-4...DC

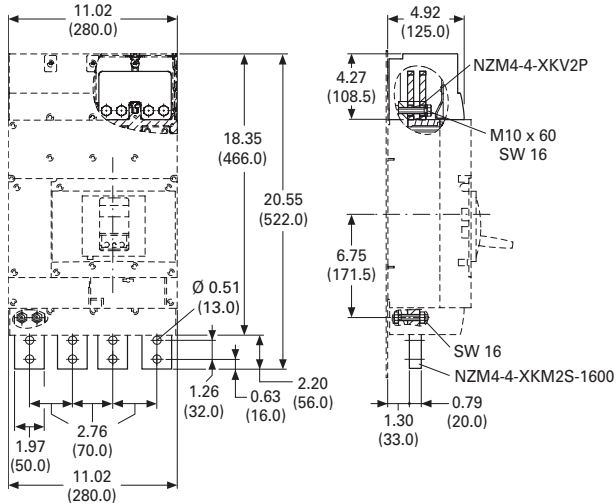


- ① Blowout area, minimum clearance to other parts.
 ≤ 690V: 3.94 (100.0)
 ≤ 1500V: 7.87 (200.0)
- ② Minimum clearance to adjacent parts.
 ≤ 1000V: 0.59 (15.0)
 ≤ 1500V: 2.76 (70.0)

Jumper Kit, NZM4-4-XKV2P-K



Jumper Kit, NZM4-4-XKV2P



600 Vdc and 1000 Vdc Disconnects

**Contents****Description**

DC Switches

DC Switches**Product Description**

Eaton's new offering of PV switches have multiple poles factory-wired, and they are approved for NEC Article 690 applications right from the box. Other manufacturers require the contractor to add jumpers to a two- or three-pole switch, add a neutral, and add labels to meet this requirement. For fusible switches, the new Eaton PV switch requires only one fuse per switch—saving the customer at least one fuse on each switch.

For more information on Eaton's DC Switches, please see **Tab 2.4** of this catalog.

DC Switched Combiners**Contents****Description**

DC Switched Combiners

3**DC Switched Combiners****Product Description**

The Eaton switched combiner (ESC) unites Eaton's 600 Vdc solar disconnect and source-combiner box in one convenient enclosure (1000 Vdc Switched Combiners available late 2012).

For more information on Eaton's DC Switched Combiners, please see **Tab 2.5** of this catalog.

3.6

Dry-Type Distribution Transformers

Encapsulated Transformers

Dry-Type Transformer Family

3



Contents

Description

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Encapsulated Transformers

Ventilated Transformers/

Open Core-Coil Assemblies

V15-T3-43

Encapsulated Transformers

Product Description

Eaton's family of encapsulated transformers is ideally suited for harsh outdoor environments.

Their standard enclosure is NEMA® 3R rated, and are also available in NEMA 3R stainless steel, or NEMA 4X enclosures. The core and coil assembly is completely embedded in a sand and resin compound that seals out moisture and other contaminants.

Please refer to **Volume 2—Commercial Distribution**, CA08100003E, Tab 2 for more information.

Dry-Type Transformer Family



Contents

Description

Encapsulated Transformers	V15-T3-42
Ventilated Transformers/ Open Core-Coil Assemblies	

Page

V15-T3-42

3

Ventilated Transformers/Open Core-Coil Assemblies

Product Description

Eaton offers a complete line of ventilated and totally enclosed non-ventilated transformers, in a variety of K-factor ratings and efficiency levels. Please refer to **Volume 2—Commercial Distribution**, CA08100003E, Tab 2 for additional information on Eaton's standard product offering.

In addition to these standard products, Eaton also offers custom design capabilities to meet the specific requirements of the solar industry. We offer special dimensions and layouts to meet a specific customer's needs. We can also design transformers to meet CEC weighted-efficiency levels, or other efficiency levels if necessary. Please contact your local Eaton representative for additional information on Eaton's custom design capabilities.